Zip-Loader Installation, Operations, and Technical Documentation for GT-75

(Including 1/16” Knife and Hopper Options)

Description

The OmniTurn Zip Loader is a multi-mode auto-loader that works as a short bar-loader or as a part-loader.
Bars or parts are lifted one at a time from the tray (or hopper) onto a guide-trough, then fed through the spindle liner into the collet.
Parts can be qualified from the face or from the rear, for overall length.
When the part is located, the collet is closed and the part is machined.
After machining, the part is ejected and the cycle begins again.

This document includes the hopper option and the 1/16” knife option.
The 1/16” knife is designed for loading parts or bars as small as 0.070” diameter.
The parts hopper option is designed to increase the number of parts that can be loaded with the ZipLoader. The standard hopper accommodates parts from 1/2” diameter to about 1/8”. For hopper operation with parts as small as 0.085” diameter some modification would be necessary.

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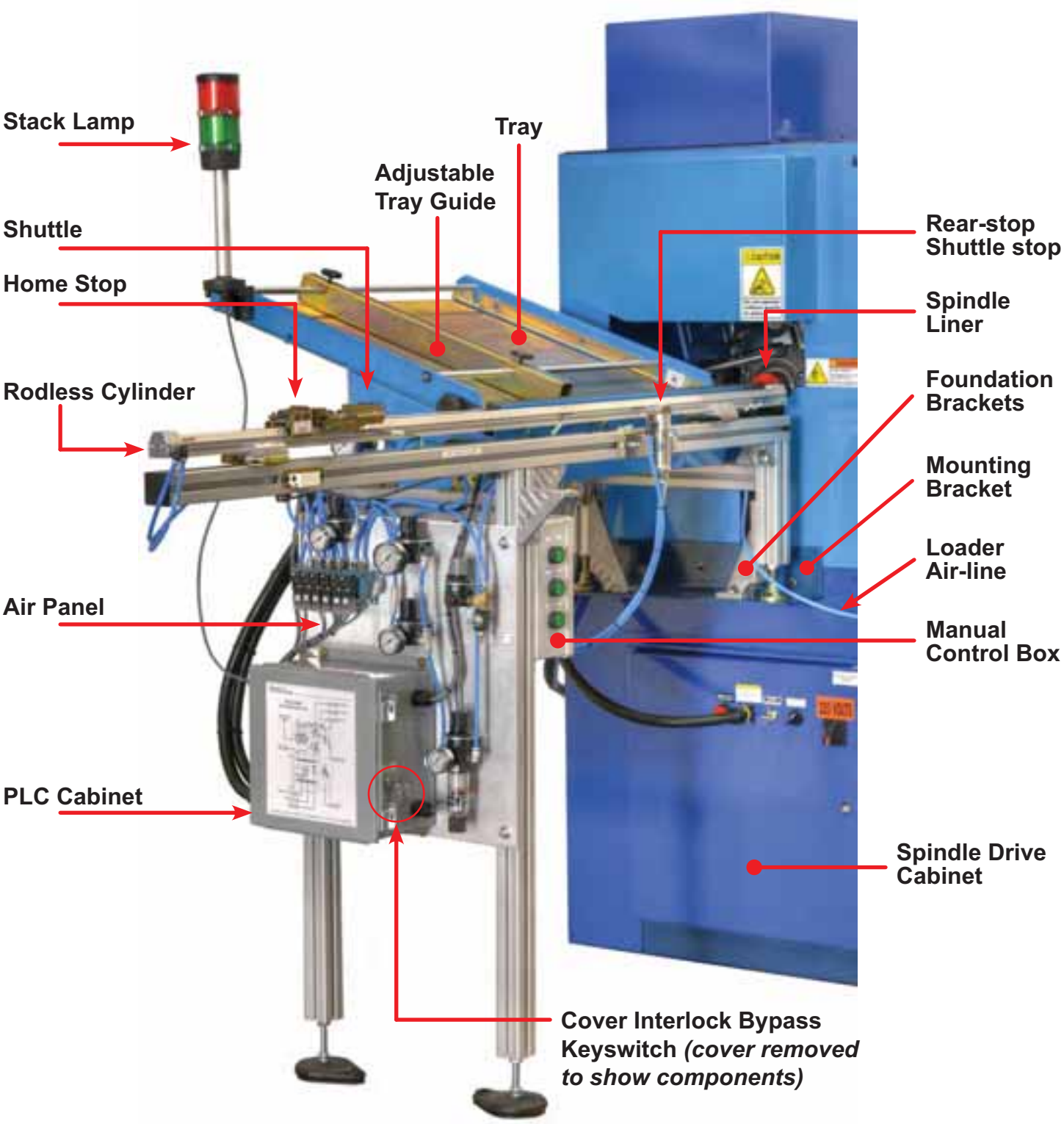
Zip Loader w/Hopper: Major Components

Before using your Zip Loader, become familiar with the component parts

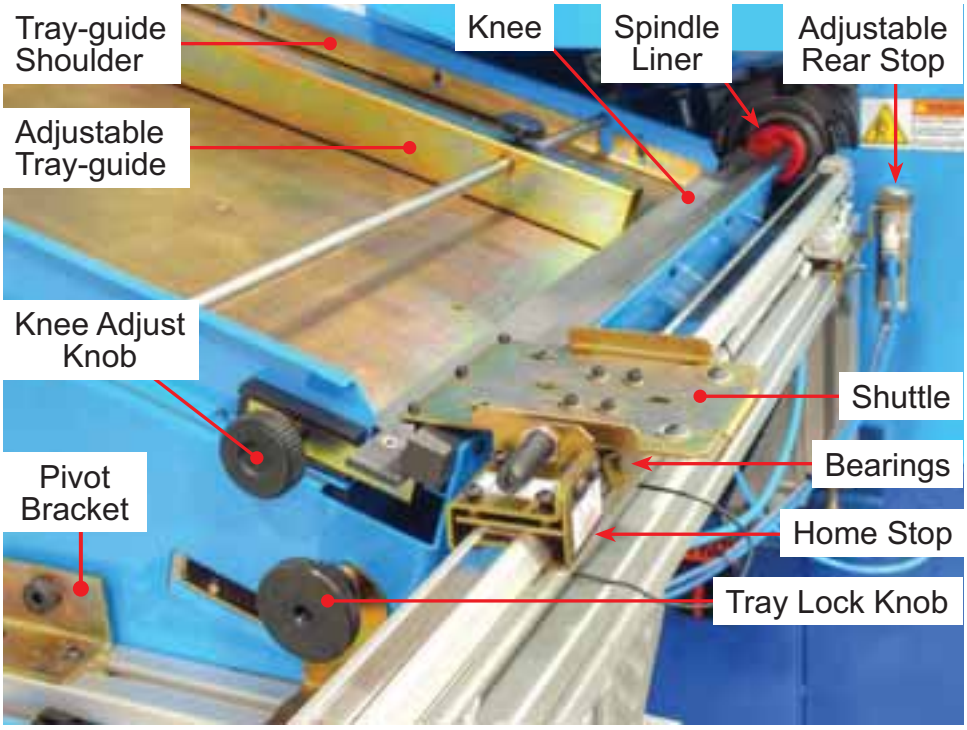


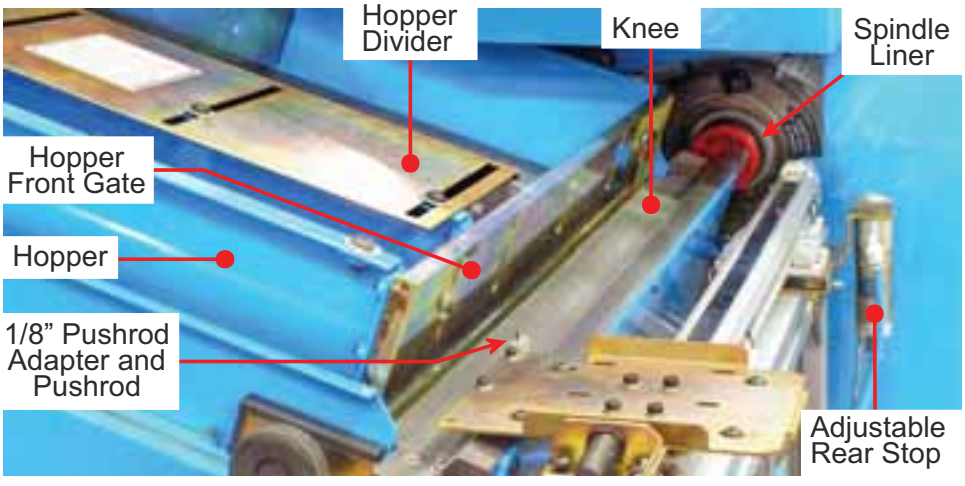
Component Parts, Overview

Tray-guide Shoulders keep small diameter parts in tray from crawling over one another
Adjustable Tray Guide is set to accommodate the length of parts in tray
Knee Adjust Knob allows Knee to be set and locked
Pivot Bracket allows the chassis to keep vee on center for different part diameters
Tray-Lock Knob allows tray to pivot to put different diameter parts at center of spindle liner
Home Stop is set so end of Pushrod clears parts before load-cycle begins
Bearings give additional support to the Shuttle Plate (rodless cylinder has internal bearings)
Shuttle Plate carries the Pushrod on the rodless cylinder
Adjustable Rear Stop stops Shuttle Plate to qualify parts for overall length
Spindle Liner To change spindle liner, remove pushrod from shuttle, loosen tray-lock knob and remove micrometer lock knob,then pivot tray assembly out of the way.
Knee is moved away from knife (not shown) as part diameter is increased
NOTE: Cover removed to show parts; use bypass key-switch on PLC cabinet to run with cover open

Standard ZipLoader

The standard ZipLoader uses 1/4” pushrod with pushers sized to accommodate parts from 1/4 to 1” in diameter. Parts as small as 3/16” are routinely loaded.





Hopper and 1/16th Knife options

The 1/16th knife option uses 1/8” pushrod to load parts as small as 0.070” diameter. Extreme care is required to reliably load such small parts.

Component Parts, Sensors

There are five magnetic sensors on the rodless cylinder as follows:

Home: Mounted at left, farthest from collet closer, this sensor must light when the shuttle-plate is at the adjustable home stop. Move the adjustable home stop and “home” sensor as required to locate pusher just to left of part so as to minimize cycle-time.

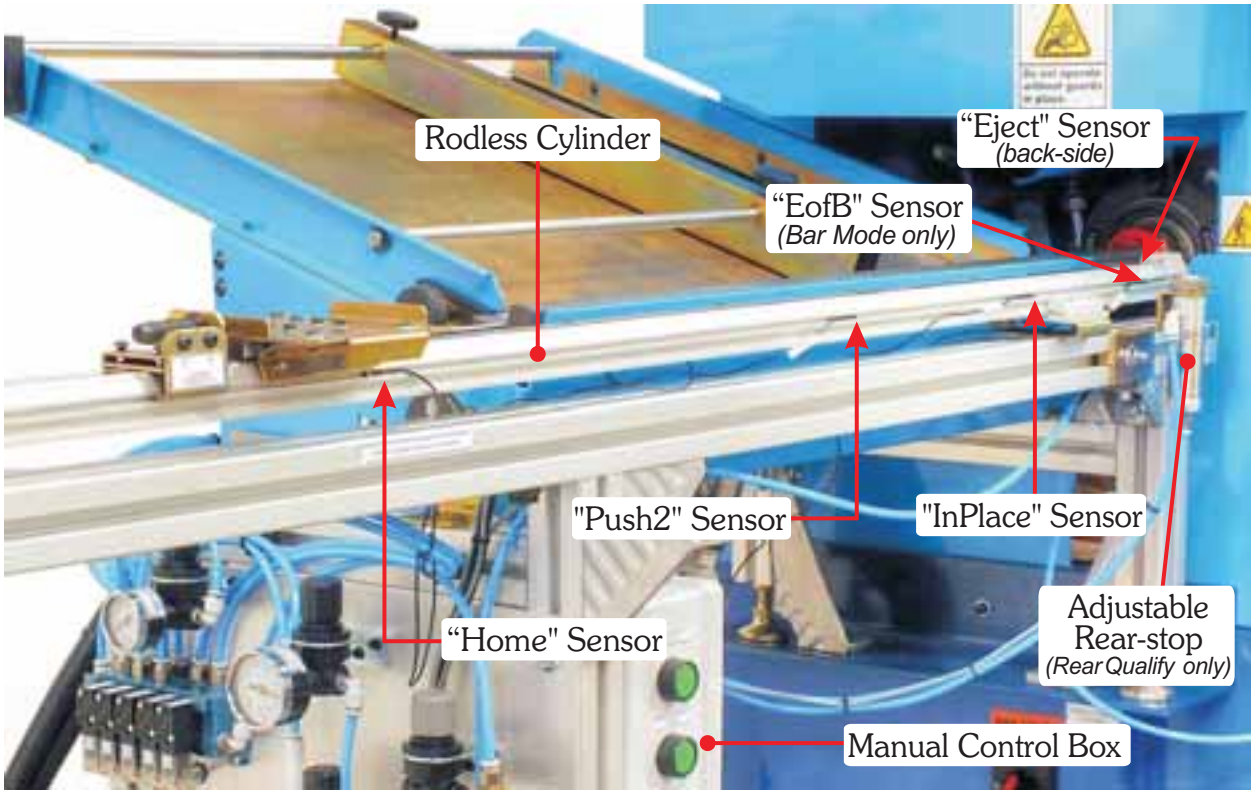
Push2: The Push2 sensor signals the PLC to change to speed set by Push2 flow control. Usually set to slow the shuttle so bar or part does not hit stop too hard, but can be set faster for special applications. Experiment with location of Push2 sensor and setting of Push2 flow control to best suit your particular application.

InPlace: When using the loader in Part Mode (M51) or Rear Stop Mode (M52) the InPlace sensor signals the PLC that the part is in place and collet can be closed. Note that in Rear Stop Mode, the Part Located sensor on the table-mounted stop must also be lit.

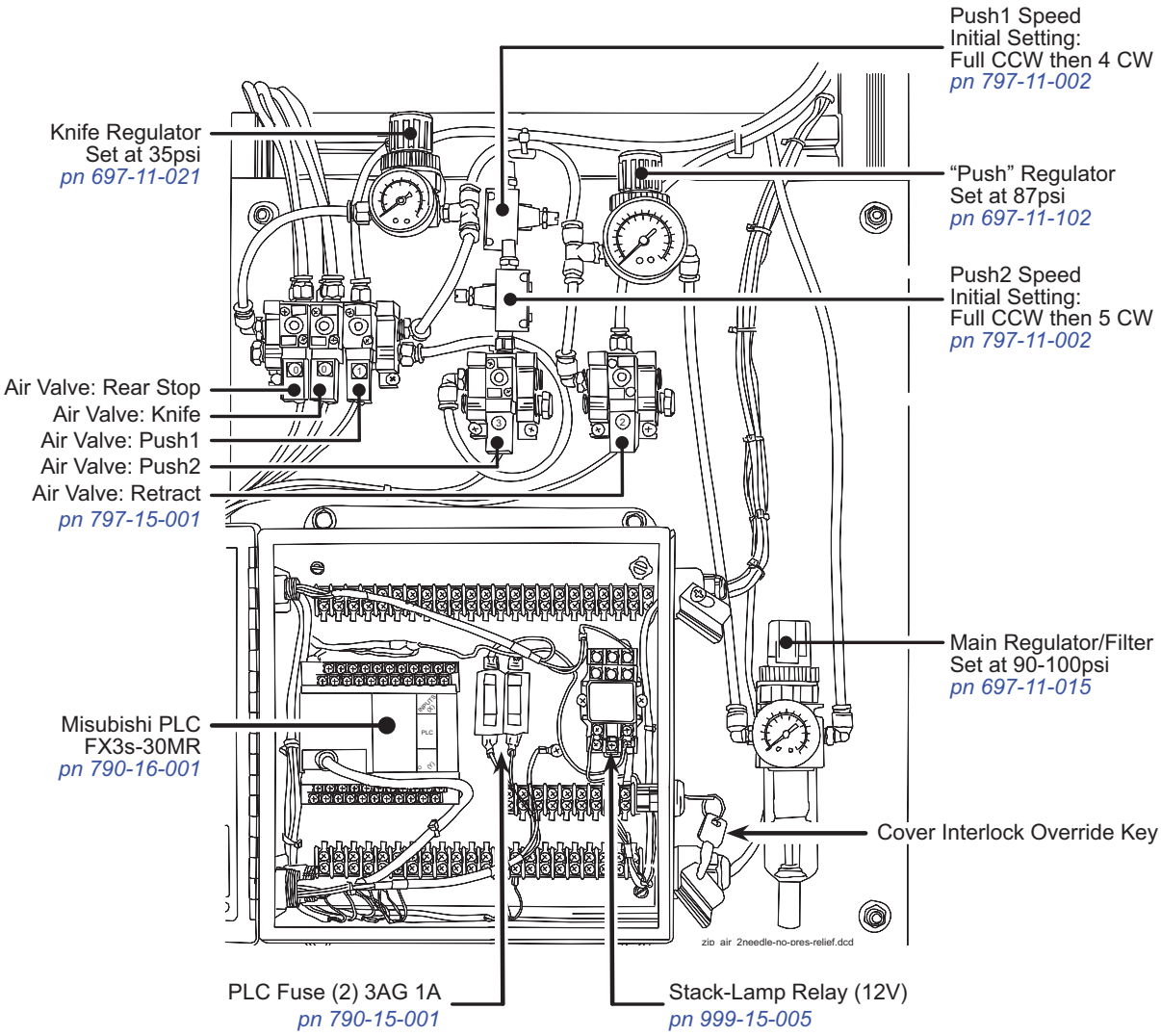
EoB (End of Bar): When using the loader in Bar Mode (M50), the EoB sensor signals the CNC to execute “eject remnant and load new bar” subroutine.

Eject: Mounted nearest collet closer, this sensor must light when the shuttle is at the far right of rodless cylinder. The push-rod should just clear the collet at this point, which allows the finished part to fall free. Should never need adjustment.

When adjusting Limit Sensors, don’t overtighten.



Component Parts, Air Panel



About Pressure & Speed

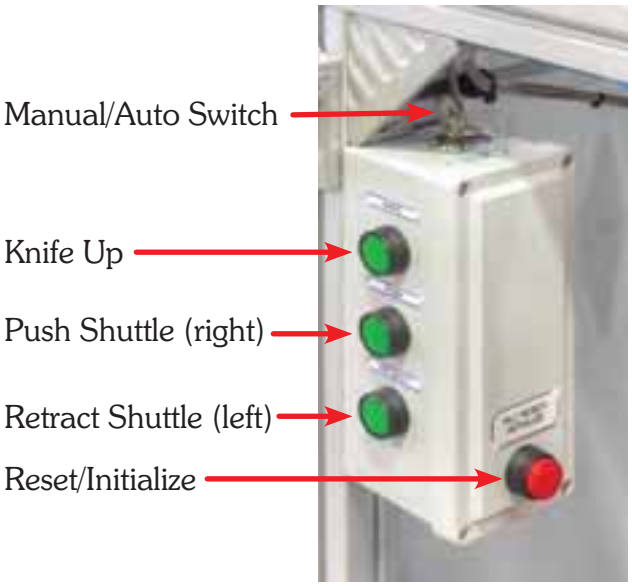
CHANGES: *In October, 2022, the obsolete "Slow" designation was changed to "Push2" and the "Fast" designation was changed to "Push1". Old labels "Slow" & "Fast" are now "Push2" & "Push1". Also added feature M57 to* ***not*** *change speed at Push2 sensor. This feature allows "Inertial Eject", so parts smaller than 1/8" dia can be ejected w/o turning down the pusher.*

Set the "Push" regulator to 87psi. Speed is controlled by the "Push1" Speed and "Push2" Speed flow controls. The "Push2" pusher speed is independent of the Pusher. The flow-control that is effective is determined as follows:

M47 (load new bar or part): speed is determined by the "Push1" flow-control setting. When shuttle crosses "Push2" sensor, speed changes to "Push2" flow control setting unless M57 (no Push2 speed).
M11 (open collet and push): speed is determined by the "Push2" flow-control setting, unless M57. If M57, then Push1 speed is effective.
M48 (eject): speed is determined by "Push1" flow-control, unless preceded by M59. With M59 (push2 eject): speed is determined by "Push2" flow-control. Use M59 for either slow eject or inertial eject.

Observe the loader in operation, and adjust the controls as required to insure reliable operation.
To adjust flow controls, a long common-head screw-driver is recommended.

Component Parts, Manual Control Box



The Manual Control Box allows manual operation of the knife and the pushrod. Also provides reset after fault.

A key-switch on top selects manual or auto mode. When set to manual mode, the green push-buttons are illuminated.

The loader will not respond to the load, feed, or eject commands from the CNC when in manual mode.

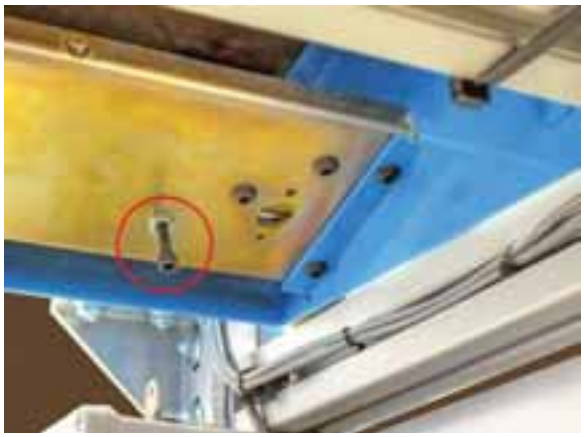
If the loader or the CNC faults, the red “Reset/Initialize” push-button will illuminate. Pressing Reset when lit will open the collet on the GT-75, retract the rear-stop shot-pin and table-mounted stop, and retract the shuttle to home.

When trouble-shooting loading issues, always *issue M56 from MDI mode to force a loader fault, then press Reset/Initialize before continuing.*

Component Parts, Tray-guide Shoulders

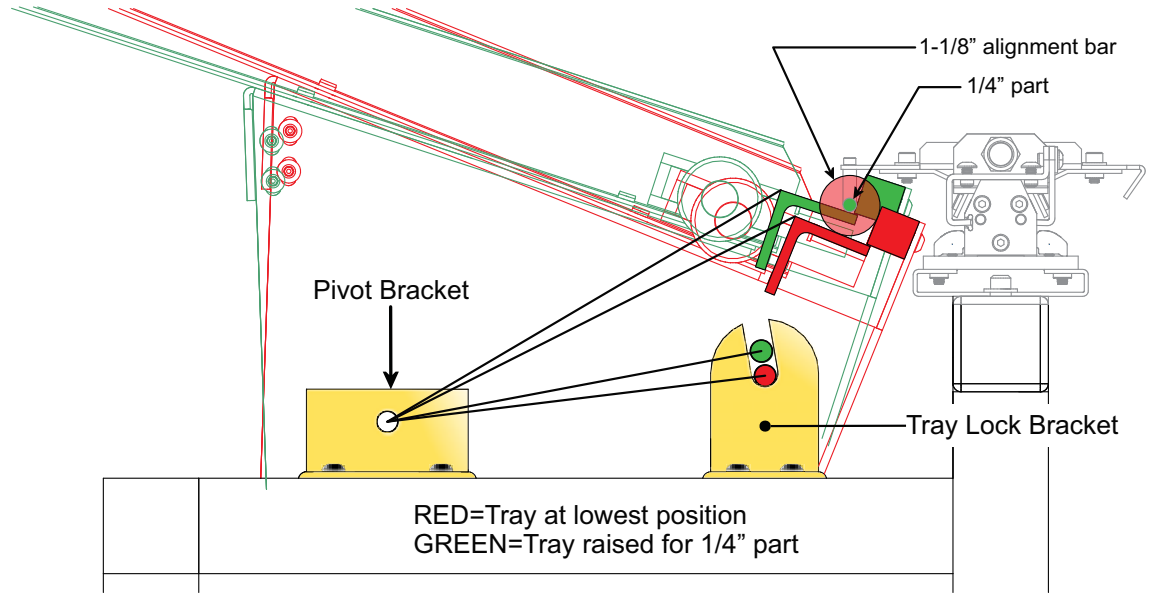
The Tray-guide shoulders are used with small diameter parts to keep them flat on the tray. The height is set to allow clearance for the parts to roll down the tray. Note that as the shoulders are raised or lowered, the front edge moves away from or toward the knife (hidden under the first rod in this picture). The front edge of the shoulder must clear the rod resting on the knife.

Component Parts, Knife-down Jack-screws



Located under the knife support plate, two 10-32 jack-screws allow precise adjustment of the knife when it’s down. This adjustment is critical for parts with diameter less than 3/16”. With these small diameter parts, if the knife is set too low, the next part will tend to crawl over the part on the knife; if the knife is set too high, the next part will tend to burrow under the part on the knife.

Component Parts, Tray Pivot



As tray pivots, centers of different diameter parts align with pusher and spindle-liner.

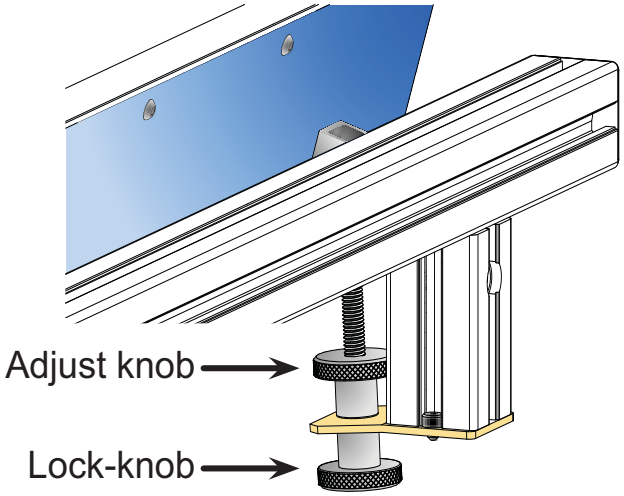
For part diameters down to about 1/4", the loader is aligned to the spindle by loosening Tray Lock Knob and Micrometer Adjust Lock Knob and pivoting the tray to its lowest position. Adjust as required for 1-1/8" dowel to be centered in the drawtube. The center of the tray pivot is such that different diameters, down to about 1/4", stay on center without lateral adjustment.

Component Parts, Micrometer Adjustment

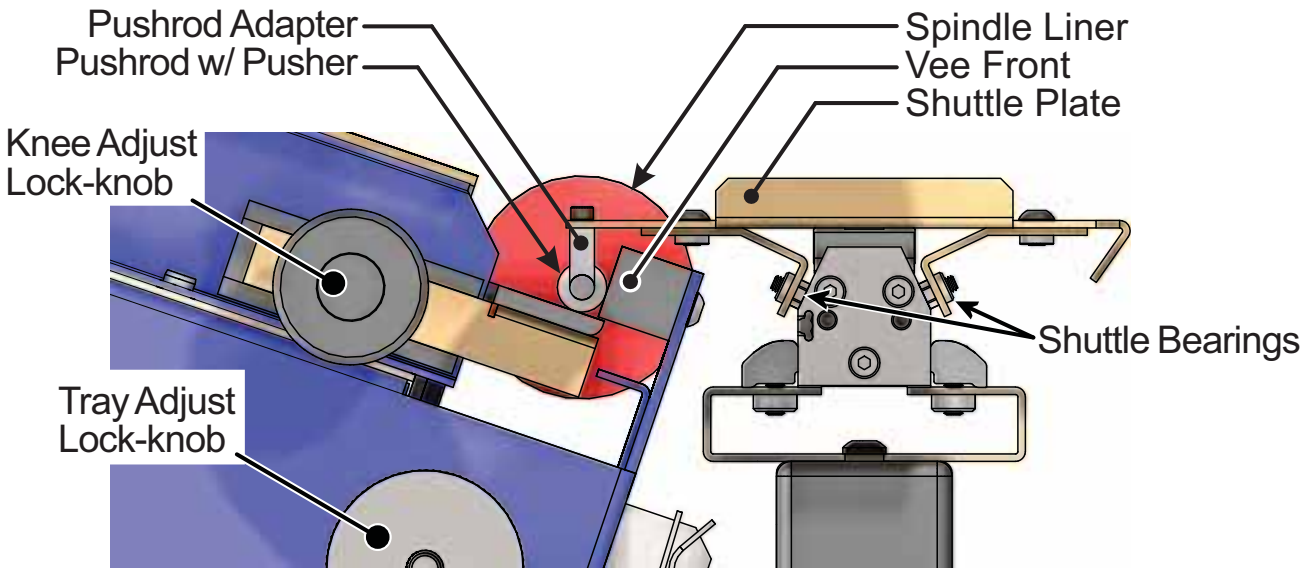
Right-side Tray Lock Knob has been replaced by micrometer adjustment.

To adjust the tray height, loosen the left-side tray lock knob and lock-knob on micrometer adjustment. Use the adjust knob to set the tray height, then tighten lock-knob.

To change liners, lock-knob must be removed so tray can swing clear of liner.

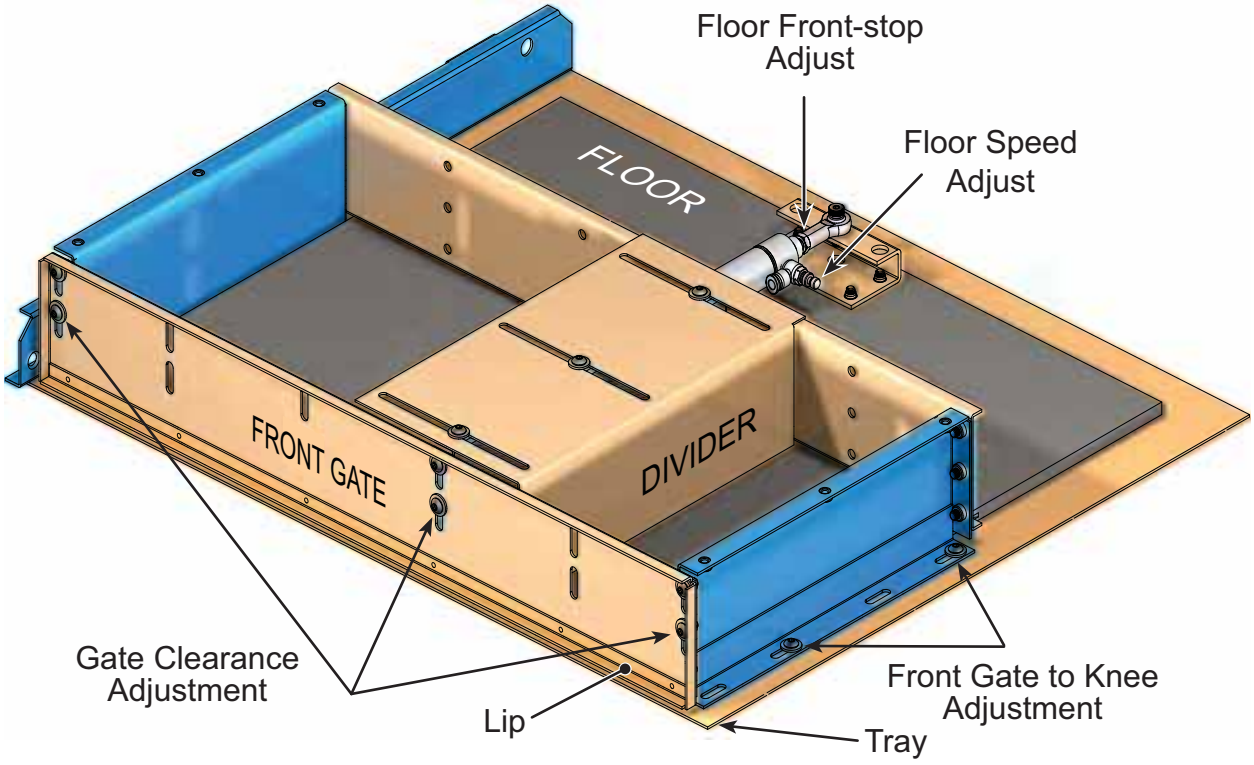


Component Parts, Vee & Pushrod



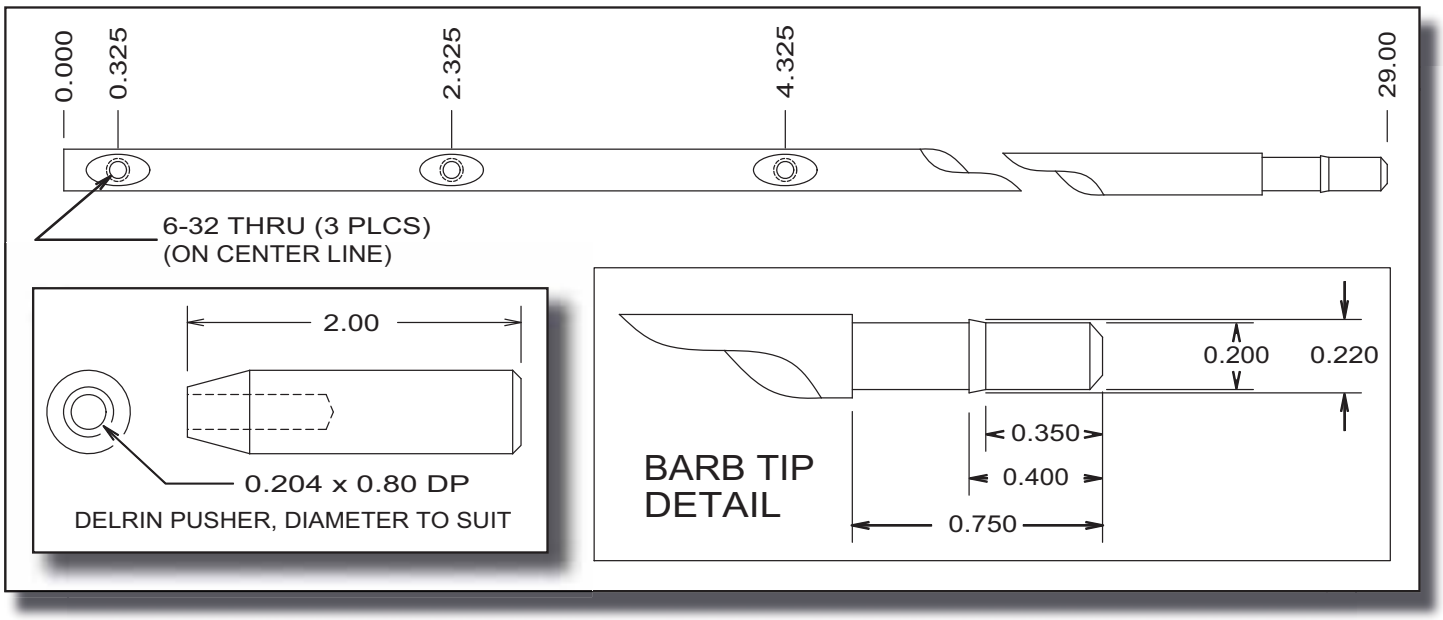
When aligning the ZipLoader for parts with diameters 1/8” or less, simply rotating the tray assembly may not be satisfactory because the accuracy required to align the part with the liner is much higher for small parts.

Component Parts, Optional Hopper



Pusher and Push-rods

Delrin pusher should be such that overall length of push-rod and pusher is about 30.25”. Drawings below describe standard push-rod and typical pusher. The smallest diameter for this combination is about 5/16”. For smaller diameters see list below drawings.



Push-rods for small diameter parts

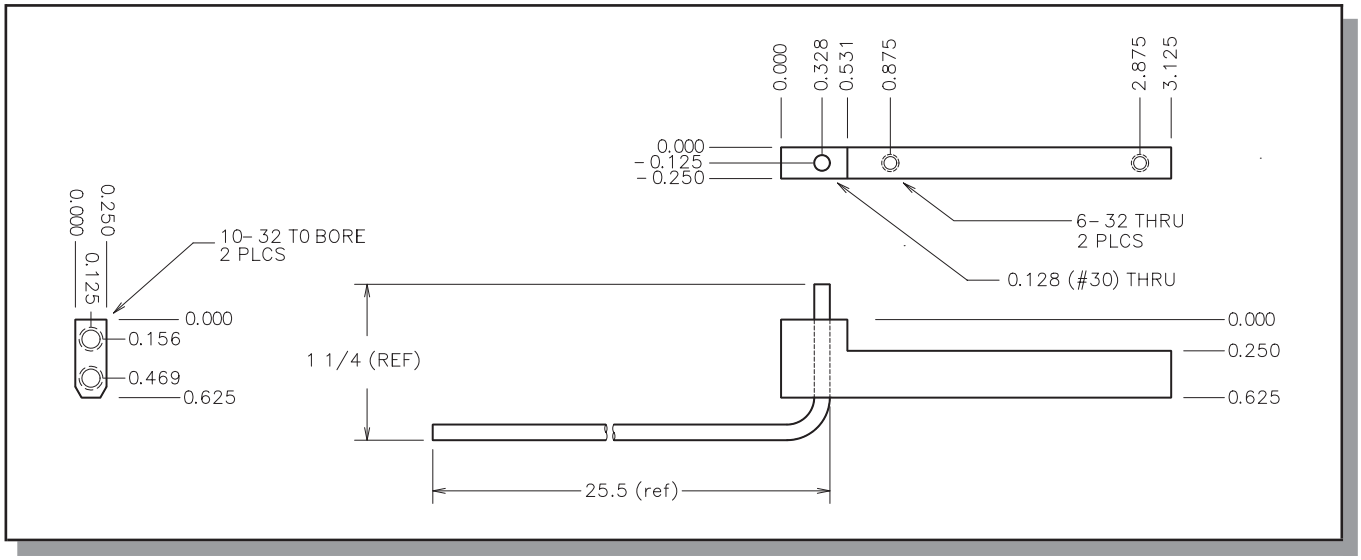
The OmniTurn ZipLoader is capable of loading parts as small as 0.089” in diamter, but special pushrods are necessary. For the smallest diameters, a thinner escapement knife is required. We stock the necessary pushrod components, or you can fab your own from these drawings.

Standard pushrod, as shown in drawing above:
p/n 790-02-006 (standard pushrod w/barb)
For 1/4” parts, a plain 1/4” pushrod is used. It is as drawing above, except 30.25” long, no barb:
p/n 790-02-017 (plain 1/4” pushrod)
For parts 1/4” to 3/16”, the same 1/4” plain pushrod is used, except turned down a/r to clear collet.
NOTE: If Inertial Eject is used, the tip does not need to be turned down.
For most parts 3/16” to 1/8”, a 3/16” pushrod is used, with 4-40 holes instead of 6-32. Can be turned down to clear collet, or use Inertial Eject. Requires 3/16” adapter plate:
p/n 790-02-020 (3/16” pushrod)
p/n 790-02-004 (adapter plate)
For some parts 3/16” to 1/8”, a plain 1/8” pushrod is used. Requires special adapter plate:
p/n 790-02-015 (1/8” pushrod) See next page for description
p/n 790-02-005 (adapter plate) See next page for description
For parts 1/8” to just under 3/32”, 1/8” pushrod and thin knife option is required:
p/n 790-09-101 (1/16” escapement knife assembly)

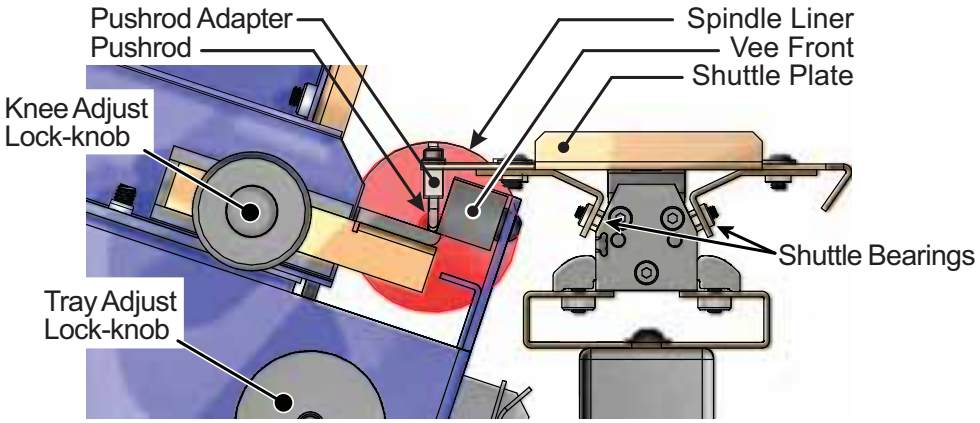
Inertial Eject: The pushrod can eject small diameter parts without passing through the collet by using Inertial Eject. The setup takes some finesse, and not all part / pushrod diameters are suitable, but the technique eliminates the need to turn down the pushrod to clear the collet. Essentially, the eject sensor is moved to the left, so the pushrod stops before hitting the collet, and the speed is set fast enough so that when the pushrod stops the part continues through the collet. Functions M57 and M59 are used, and the M43 (retract) is increased (or issued twice) so that the pushrod gets up to speed before hitting the part. See pages 27, 31 and 36 for more information about inertial eject.

1/8” Push-rod and Pushrod Adapter

The drawing below describes the adapter plate that holds the pushrod to the shuttle plate, and the pushrod itself. The pushrod is any kind of 1/8” drillrod, bent to 90° as shown and cut to about 25.5” long. The actual length is just sufficent for the pushrod tip to clear the collet when the rodless cylinder shuttle is at the far right side of the loader (eject sensor lit).



Vee & 1/8” pushrod adjustment



When aligning the ZipLoader for parts with diameters 1/8” or less, simply rotating the tray assembly may not be satisfactory because the accuracy required to align the part with the liner is much higher for small parts.

To align the loader: rotate the tray and adjust lateral position of loader to put part on center of spindle liner. Put the pushrod in the vee by moving the shutlle plate and by adjusting height of pushrod in pushrod adapter. NOTE: The bend of the pushrod should not quite rest in the vee; the wieght of the rod will keep the tip in the vee.

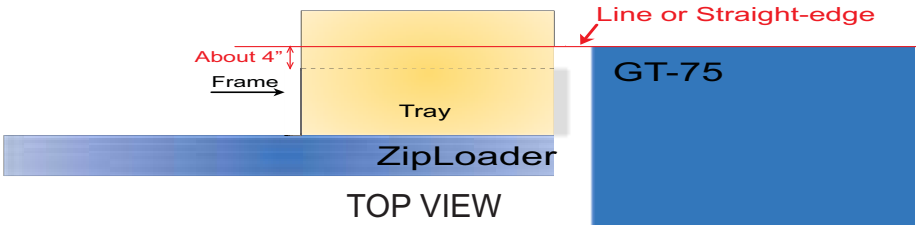
Loader Setup and Alignment, Mechanical

NOTE: If your ZipLoader shipped wih your OmniTurn, it was was aligned to the machine at the factory. The front leveling mounts and foundation brackets are properly set. Only the rear leveling mounts need adjustment to level the loader to the machine on your floor.

Setup the GT-75 and insure that it is fully operational and level before attaching the Zip Loader.

1. Attach to bracket

If the ZipLoader was shipped with the OmniTurn, a mounting bracket is attached to the lathe. Foundation brackets on the Zip Loader are attached to this mounting bracket. Attach the Zip Loader to the mounting bracket as shown. Two 1/4-20 screws through slots in foundation brackets secure the loader to the mount.



2a. Align to spindle, shipped with lathe from factory

If the ZipLoader was shipped with the OmnTurn, no vertical alignment adjustment should be necessary. Use a string along the back of the lathe to align the loader parallel to the machine. Before tightening the screws that hold the foundation brackets, adjust the loader as required to allow your parts to pass smoothly from the guide-trough ('vee') into the spindle liner. Use the shuttle as a handle and manually move the pushrod.

The much smaller parts used with the 1/16" knife require more attention to alignment details. If the loader was aligned at the factory, the settings will be pretty close, but may have changed during shipment. Pushrod speed and the location of the Push2 sensor (and setting of the Push2 needle valve) all affect reliable feeding of small diameter parts

2b. Align to spindle, starting from scratch

To align a loader that wasn't shipped with a lathe, loosen the tray lock knobs and pivot the tray to its lowest position and set the height so the 1-1/8" alignment rod slides freely from 'vee' into drawtube. Pivot the tray all the way up to install liner, then pivot back down to allow smooth feeding of your part.

3. Attach stacklamp

Attach the stack lamp to the tray-side and connect it to the PLC Cabinet at "Stack Lamp".
Note cables and air line routed to back of CNC: these connections are discussed in item 6, on following page.

Loader Setup and Alignment, Electrical

4. Locate cables at Zip LoaderPLC Cabinet

Three cables connect the Zip Loader PLC cabinet to the GT-75: A yellow and blue tagged cable from the left side of the cabinet, and an unmarked cable from the right side. The unmarked cable is paired with a blue air-line.
The yellow-tagged connector goes to the spindle-drive cabinet door and the blue-tagged connector goes to the CNC back panel.
The unmarked cable is used for the spring-loaded table-stop, required for parts that must be qualified from the rear for overall length (see #6, below).

5. Connect cable at Spindle Drive Cabinet

Route the yellow-tagged cable from the PLC cabinet to the spindle-drive cabinet door at connector marked “Spindle Cab to PLC”;

6. Connect cables at CNC Rear Panel

Route the blue-tagged cable from the PLC cabinet to the CNC back panel at connector marked “PLC”.

The small in-line connector and blue air-line marked “Table Stop” are used when parts must be qualified from the rear, for overall length. They connect to the spring-loaded stop which gets mounted on the tooling plate (table) in the GT-75.

Front-stop applications don’t require this feature. The spring-loaded stop is stored in the PLC cabinet.

Loader Setup and Alignment, Air

7. Connect Loader Air

Main air for the loader connects to a bulkhead fitting above the spindle drive cabinet marked “Loader Air”.
Loader air main regulator should be set for 90 - 100 psi.

System Test, Manual

This test is for your benefit, to verify that nothing broke in shipping.

Perform this test after attaching loader to GT, and before doing any critical alignment of the hopper and loader. The only alignment requirement is that the pushrod moves freely in the spindle liner bushing. Do not put any parts in the tray or hopper yet.

Set disconnect on spindle cabinet ON; set CNC control ON. After boot-up, set servos ON.

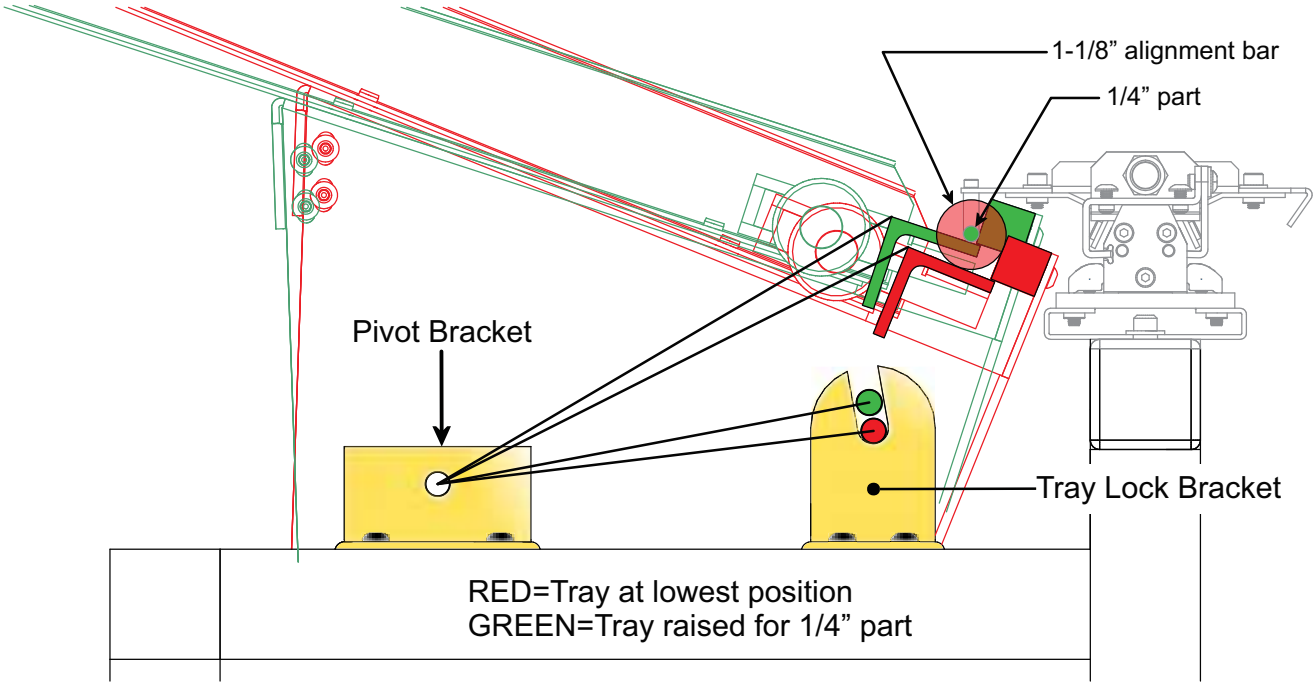
1. Verify that Auto/Manual keyswitch on Loader Manual Control is in Auto (switch lamps not lit).
2. Verify that green stacklamp is lit.
3. Push loader shuttle against adjustable home stop; verify that “Home” sensor is lit.
4. Move the shuttle to “InPlace” sensor; the sensor should light.
5. Move the shuttle to the “Push2” sensor; sensor should light.
6. Move the shuttle to “EoB” sensor (End of Bar); sensor should light.
7. Push the shuttle to stop at right; “Eject” sensor should light. (Eject sensor is on back side)
8. Set Auto/Manual keyswitch on Loader Manual Control to Manual; three green push-buttons should light.
9. On knife cylinder, verify that LED on lower sensor is lit.
10. Press “Knife” switch; knife should rise smoothly. Upper sensor on knife-cylinder must light and lower switch must not be lit. Release switch; knife should return.
11. Press “Push” switch; shuttle should move to your right; press “Retract” until shuttle returns to home. Home sensor must light.
12. Set Auto/Manual switch to Auto. Home the CNC and go to MDI mode. Front door of GT-75 must be closed or the door interlock bypass key-switch must be engaged; ziploader cover bypass key-switch on PLC cabinet must also be engaged.
13. Issue M40; knife should go up, as in Step 10, above. Issue M41; knife should go down, as in Step 10, above.
14. Issue M45: rear stop shot-pin and spring-loaded stop piston rod should extend. Verify rear stop shot-pin sensor is lit. M46 to retract.
15. Issue M56; red stack-lamp should be lit. (This is a forced loader-fault; useful for reinitializing the loader).
16. Move the shuttle off the home sensor. Press Reset/Initialize switch on loader; shuttle should return to home and green stack-lamp should be lit. This demonstrates that the PLC ladder is functioning.

This completes the manual system test.

Loader Alignment and Changing Diameters

The procedure for aligning the “vee” of the loader to centerline of the spindle is critical because the loader is designed so that different bar diameters will be on center by pivoting the entire tray and ’vee’ assembly. With tray assembly is at its lowest position, set the loader height so that 1-1/8” bar will slide easily into draw-tube on OmniTurn. If a liner is installed, the same 1-1/8” bar can be used with tray assembly at lowest position, but a dowel that closely fits liner must be installed on center in bar.

No other adjustment is necessary to put different diameters on center if this initial alignment is properly done. Parts with diameter less than 1/4” will probably require some additional adjustment to insure consistent feeding.



As tray pivots, centers of different diameter parts align with pusher and spindle-liner.

To accommodate different bar diameters, adjust the distance of the ‘vee’ from the knife, and pivot the entire tray to bring the new diameter on center. Knurled black-plastic adjustment knobs on each side of tray lock the ‘vee’ in place, and a single steel tray-lock knob on the left side locks the centerline adjustment.

For small diameter parts it may be necessary to ‘tweak’ the loader to insure reliable feeding. See next page: “Aligning the OmniTurn ZipLoader for Small Diameter Parts”.

Special pushrods are necessary for parts less than 1/4” diameter. See pages 10 & 11 for more information about these pushrods.

Aligning the Shuttle Plate Assembly

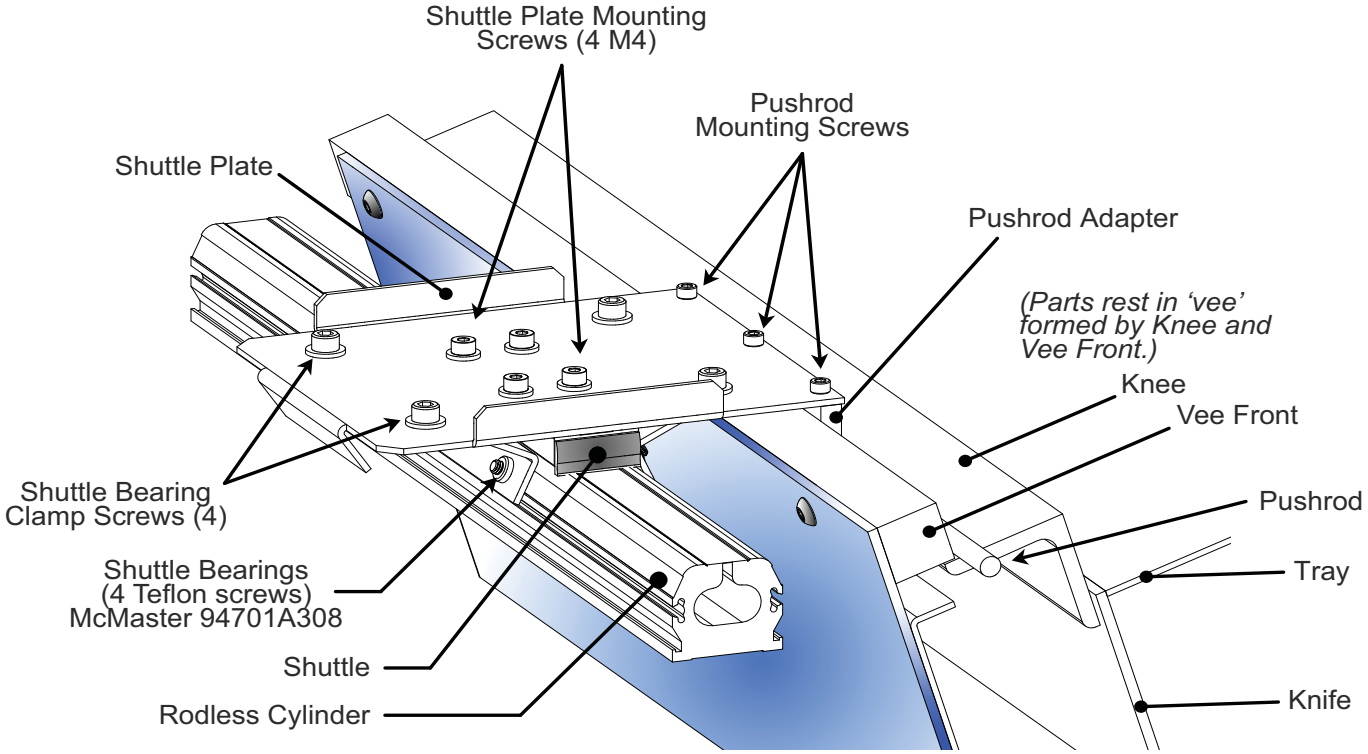
The shuttle assembly and rodless cylinder should be periodically checked for correct alignment with the 'vee'. This must be done if the rodless cylinder is replaced.

First verify that the rodless cylinder is parallel to the 'vee' front within about 1/32". A six-inch scale is adequate; measure from one edge of the band on top of the cylinder to the edge of the Vee Front at two places about 24" apart.

If the cylinder is not parallel to the chassis, loosen the Pivot Bracket and Tray Lock Bracket (see page 8) on one side and move the chassis assembly to make it parallel with the rodless cylinder. The blocks are held in place with t-nuts.

After making the chassis parallel to the rodless cylinder, the shuttle plate assembly must be aligned to the vee. There are ten screws in the top of the shuttle assembly: (shown below)
The four middle ones are M4 screws which hold the plate to the shuttle.
The two rows of two on either side of the four are 10-32 which attach the slide bearings.
The three 6-32 on the far end attach the push-rod to the plate. To align the assembly, first loosen *all* these screws.

To properly align the shuttle assembly to the vee, it is easiest to use a plain 1/4" pushrod (pn 790-02-017) which will lay flat in the vee. Pivot the tray so the pushrod lays in the vee. Verify that the push-rod lays flat in the vee. Wiggle the pusher-plate as necessary to square things up, then tighten the four M4 screws which hold the plate to the shuttle. Next, tighten the three screws that hold the push-rod to the plate. Finally, squeeze the shuttle bearings gently against the rodless cylinder and tighten the four screws which hold them in place. Squeeze too tightly and the shuttle may not move fast enough to complete the cycle.



Aligning the loader for Small Diameter Parts

See Page 11 for 1/8" pushrod description (1/16" knife option)

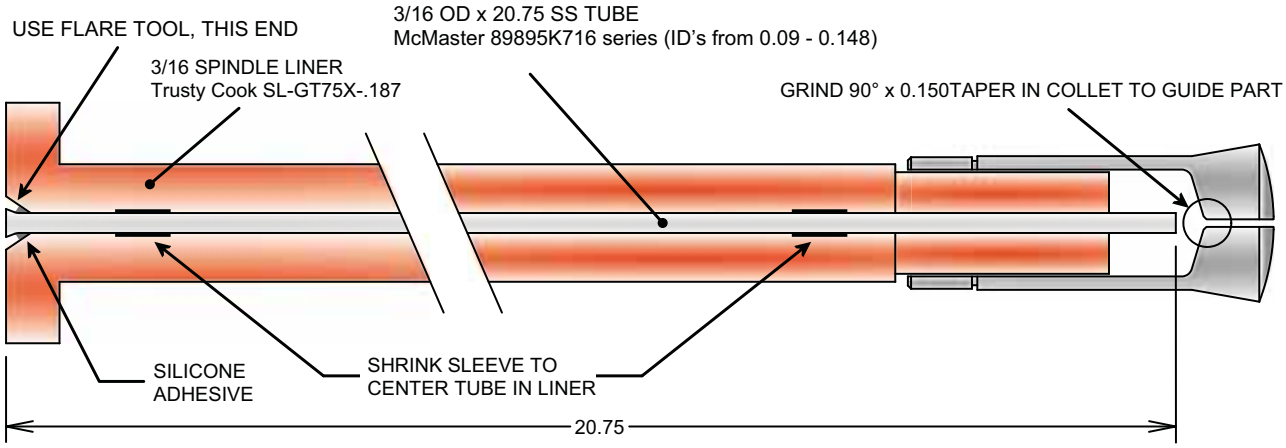
When loading parts with diameters 5/16 and greater, the push-rod is fitted with a delrin pusher which is the about the same diameter as the part, or a little smaller. Alignment is less critcal because the push-rod doesn't contact the 'vee': it is suspended between the adapter plate (at the shuttle), and the pusher. The pusher rides in the vee to push the part into the liner.

Small diameter parts are 1/4" or less. For loading 1/4" parts or bars, use a 30-1/4" long pushrod; for parts or bars down to about 3/16, turn down the end of the pusher to clear the collet so part or remnant can be ejected. For smaller diameter parts, use a 3/16 or 1/8 pushrod. For the 3/16 pushrod, put 4-40 holes in the pushrod at locations shown on page 10. Alignment is very critical because the entire push-rod rests in the vee. For 1/8" pushrod, a different adapter plate is required, and for parts less than 1/8" a different escapement knife is required.

See pages 10 & 11 for more information about the various pushrods, including part numbers.

If the small diameter parts have sharp edge on face, it may be necessary to grind a small chamfer inside the collet to insure reliable feeding. A die-grinder with a cone-shaped tool is adequate.

The in-feed chamfer on the liner can be a factor. Sharp edges catch on the urethane infeed taper, For short parts, 1/8 or less in diameter, it may be necessary to install a flared steel bushing the length of the liner, as shown below. Long parts with sharp edges may only need a "funnel" made by flaring a short piece of the steel tubing and inserting it in the liner.



Basic Alignment

The basic alignment procedure (as described on previous page) is to loosen the lock-knob at left and lower the vee to bottom. Put 1-1/8" rod in the vee. Align the entire ziploader to the drawtube with vee at lowest setting (bottom of pivot).

A 1-1/8" alignment rod ships with the loader. This rod is useful for setting the basic alignment, which is suitable for parts and bars 5/16 and greater. The vee stays on center for all diameters because as vee is pivoted up, the center of different diameters passes through the center of drawtube. The distance from the knife to the knee of the vee is adjusted for different diameters by loosening the black knurled adjustment knobs on each side. The center of each diameter should stay close enough to center of drawtube to load all diameters from 1" to 5/16 by pivoting the tray. When loading smaller parts it gets much more critical.

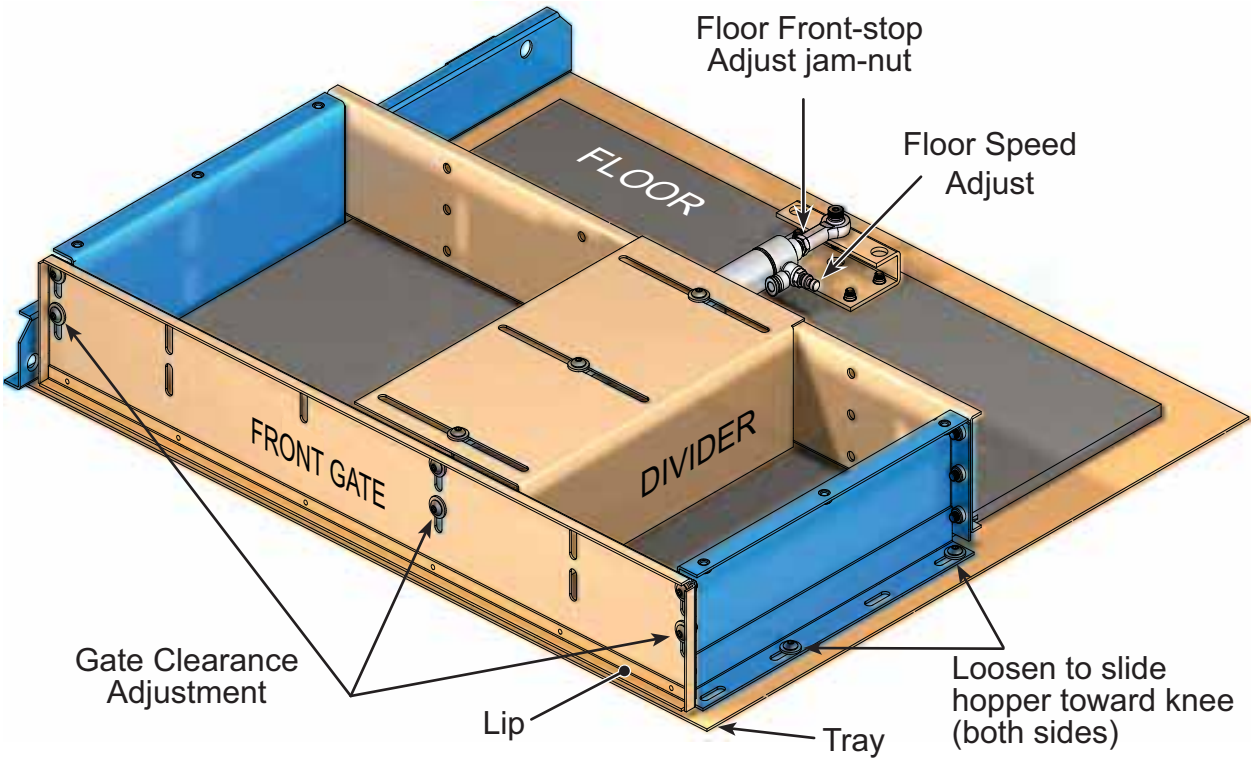
Aligning the 'vee' (rotating the chassis)

After the basic alignment is done, and the correct liner is installed, loosen the tray-lock knob and micrometer lock knob, then use micrometer adjust to rotate the chassis until parts to freely move from 'vee' into the liner. With the smallest parts it may be necessary to relocate the entire loader side-to-side to get perfect alignment. To do this, it may be easier to loosen the pivot braket tee nuts and nudge the chassis assembly.

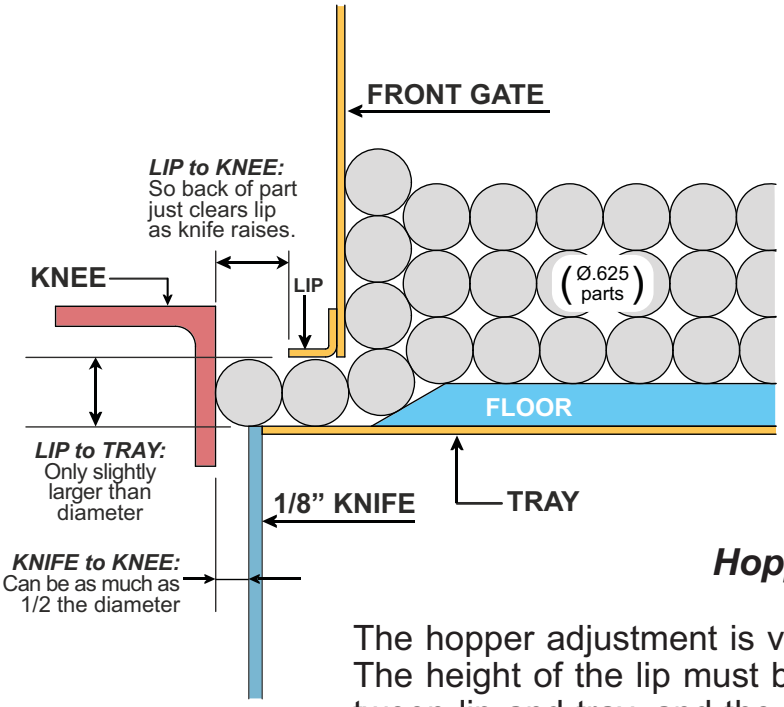
Hopper Operational Description

The parts hopper is designed to be used with the Omniturn Zip Loader to increase the number of parts that can be loaded with the ZipLoader. The hopper allows small diameter parts (1/2" - 1/8") to be loaded in quantity in a 3-1/2"h x 11-3/4" x 24-1/8" wide box, the quantity depending on the diameter of the part. The length of the part can be from approximately 2 inches, to 24 inches. The parts are then presented to the top of the knife in the ZipLoader, and loaded into the rear of the spindle for machining. The hopper can be mounted to any ZipLoader.

NOTE:
Refer to separate document "ZipLoader Hopper Kit Installation" for more detailed information regarding the hopper.



Hopper Adjustments, 1/8" and 1/16" in Knife

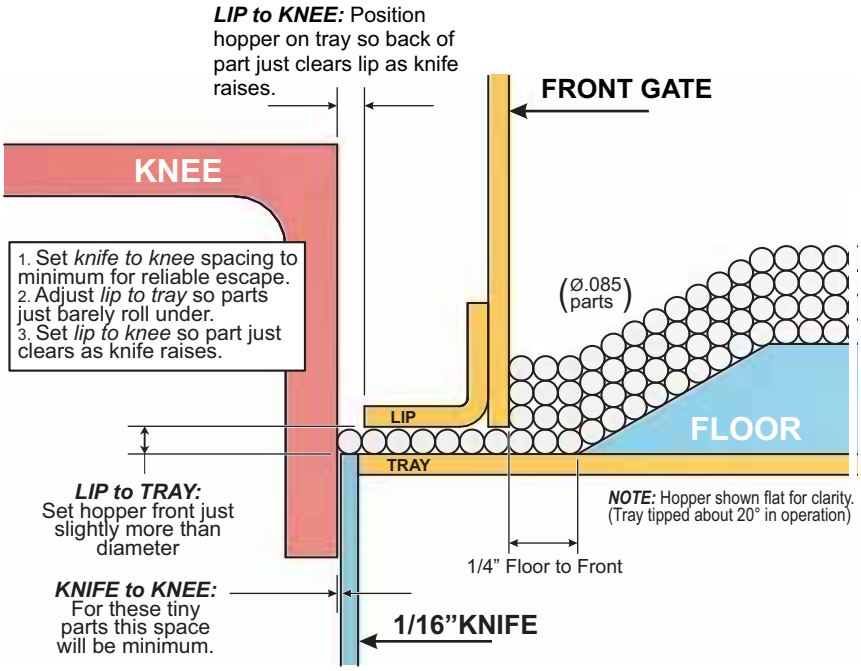


Hopper installed on standard 1/8" knife ZipLoader setup for loading 5/8" parts.

Hopper Adjustments

The hopper adjustment is very critical for parts with small diameters. The height of the lip must be set to just barely allow parts to roll between lip and tray, and the distance between lip and knee must also just barely allow one part to fit. The entire hopper is set to just clear the knife, then the knee is moved away from the knife to barely allow one part to fit between lip and knee.

Refer to separate document "ZipLoader Hopper Kit Installation" for more detailed information regarding the hopper.

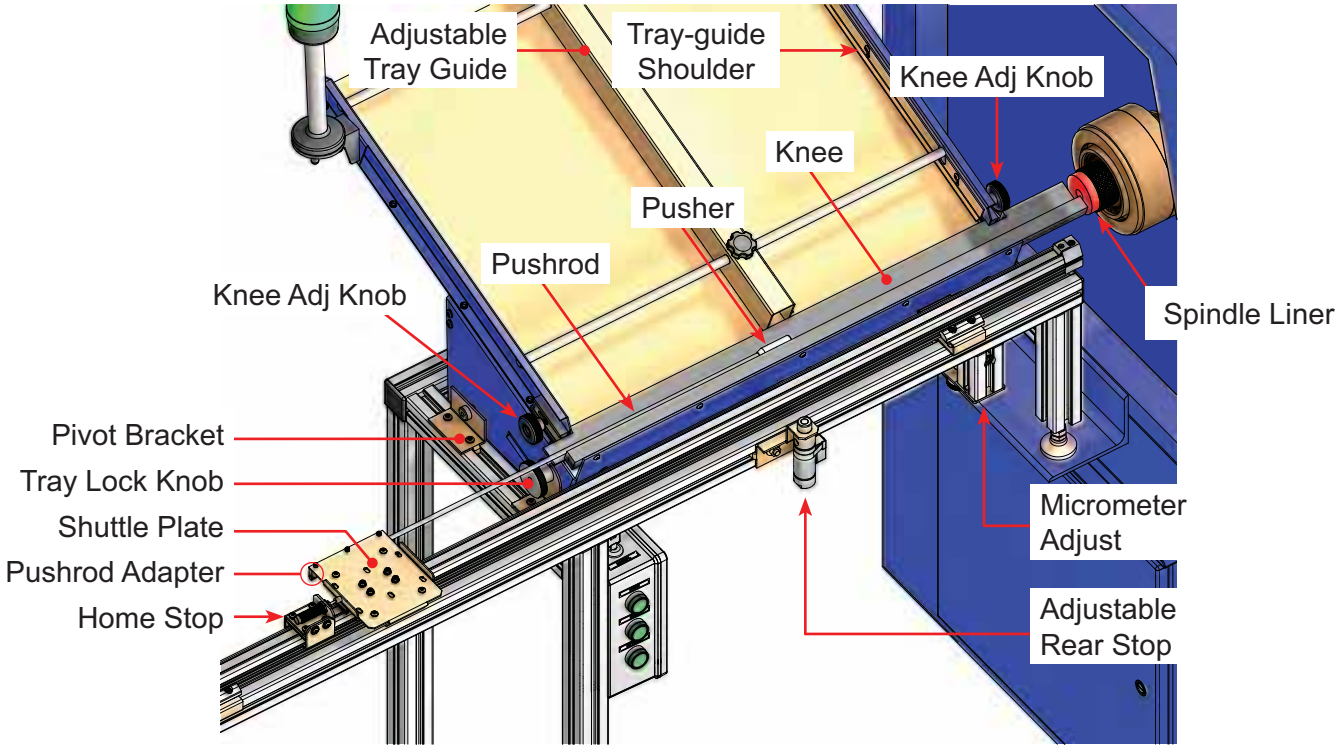


Hopper installed on optional 1/16" knife ZipLoader setup for loading 0.085" parts.

NOTE: Special modifications are necessary to reliably load parts this small.

Using the Loader

Set the **Adjustable Home Stop** so that the pusher clears the bar or part when the shuttle is firmly against the stop.
The **Home sensor** must light when shuttle is firmly against the stop.
The In **Place sensor** is used in “part” and “stop” modes; it must light when part is at either front or rear stop.
The **Eject sensor** must light when the shuttle is at far right on rodless cylinder.
The **Cover Interlock Bypass** keyswitch (on PLC cabinet) allows testing setup with cover open.



Diameter change-over. For best results, liner id and pusher od should be appropriate for the part or bar od. To change liners, remove pushrod from shuttle plate (three 6-32 SHCS), then loosen the tray-lock knob, and remove micrometer lock knob (page 8). Swing entire tray assembly up and out of the way to clear flange on liner. Liner is held in place with o-rings; it can take some effort to remove it. Liners come with three o-rings; remove one furthest from flange for easier removal.

To put the bar or part on center of the spindle, loosen steel tray lock knob and micrometer lock knob (lower knob). Slide part by hand from vee into liner, moving tray up or down with micrometer adjust until part slides smoothly. The pivot brackets are held with tee-nuts, and can be moved if fine-tuning for very small part diameters is necessary.

Plastic knurled knobs on each side of tray assembly lock the “knee” of the guide channel “vee” at correct distance for different diameter bars. Loosen knee adjustment knobs at each side of tray to adjust knife-to-vee distance for new size bar. Manually cycle knife to insure smooth delivery of the bar.

For best results, use push-rod / pusher assembly that has pusher about same diameter as your stock. Matching pusher to stock insures that pusher follows stock in vee and into liner properly.

Programming: Detailed machine setup and programming information for the different modes starts on next page.

All Modes

Overview of Operation

Common Features
The ZipLoader will handle bars or parts up to 25 inches long and 1/8" to 1-1/16" in diameter. Bars or parts are loaded into the tray. An optional hopper is available for parts up to 21 inches long and 3/4" in diameter. At start of program a new bar or part is escaped into a "vee" and pushed through collet. Load/unload times from about 3 to 7 seconds are typical, depending on size of part and material.

Bar Mode (M50)
In "Bar Mode", the ZipLoader operates as a magazine bar-loader.
New bar is pushed to hard-stop on table, and the collet is closed. After machining, the part is cut off, stop re-located at face of part, collet is opened and bar feeds out. The cycle repeats until End of Bar sensor is reached. Conditional sub-routine in program instructs ZipLoader to eject remnant and load new bar. If another bar is available the process continues as before. If there are no more bars in the tray, a second conditional sub-routine instructs ZipLoader to feed forward to Eject sensor, which stops the CNC and lights the red Stack Lamp, alerting the operator.

Second Feed in Bar Mode
To feed part further out to do more machining near collet, stop spindle (m05), locate stop near face of part, open collet and push (m11), move stop back to new Z location at 50ipm, stop pushing and close collet (m10).

Part Mode (M51)
In "Part Mode", the ZipLoader operates as a shaft-loader, and part is qualified at face. Part is pushed against a hard-stop on table which is located at face of part. Set "InPlace" sensor on ZipLoader to light at this point, which automatically closes the collet and stops pushing. After machining, part is ejected and new part is loaded. If ZipLoader shuttle passes "InPlace" sensor (no part in collet), ZipLoader stops the CNC and lights the Stack Lamp, alerting the operator to add re-fill tray.

Stop Mode (M52)
In "Stop Mode", the ZipLoader operates as a shaft-loader, and part is qualified at rear.
The shuttle stops against shot-pin on adjustable rear-stop on ZipLoader. Spring-loaded stop on table gently pushes part against pusher and collet is closed. After machining, finished part is ejected. If "Part Located" sensor on spring-loaded stop doesn't light (no part at stop), ZipLoader stops the CNC and lights the Stack Lamp, alerting the operator to re-fill tray or hopper.

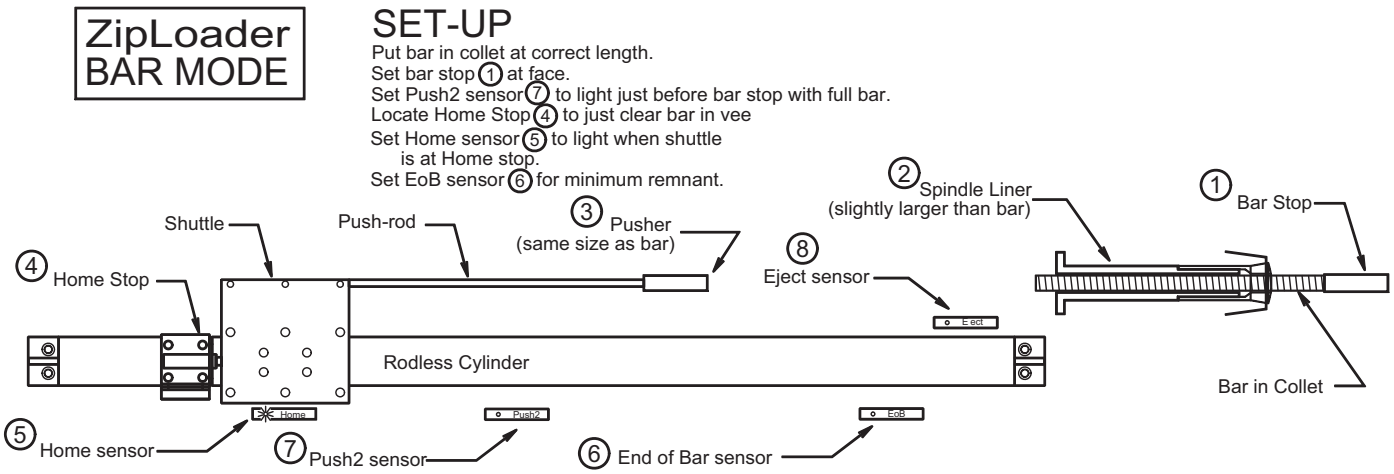
Second Feed in Part Modes
To feed part further out to do more machining near collet, stop spindle (m05), locate stop near face of part, open collet (m13), push (m42), move stop back to new Z location at 50ipm, stop pushing (m44), close collet (m12).

No Push2 Feed (M57)
Generally used when part diamer is smaller than pushrod; allows for "Inertial Eject", using M59 (below) to appy fast Push2 speed to eject cycle. Eject switch is set so pushrod stops before hitting collet.

Push2 Eject (M59)
If parts are delicate, set Push2 speed fairly slow and put m59 before m48 (eject) to gently eject parts.
If part diameter is smaller than pushrod, set Push2 speed fast, use m57 at top of program and m59 before m48 to use "inertial eject". Eject switch must be moved away from collet so pushrod doeesn't hit.

2Part Mode (M53) (option)
In "2Part Mode", the finished part is pushed out by the next part to be machined. Part can be qualified at face or at rear, by using appropriate stop on tooling plate. This mode provides the fastest load/unload times, but requires an adjustable front-stop on the rodless cylinder, and a "restrainer" on the tooling plate to prevent the second part from over-traveling. The program starts with a part in the collet. The shuttle stops against an adjustable front-stop on ZipLoader, and hard or spring-loaded stop on table locates the part before collet is closed.

Bar Mode (M50) Component Parts and Setup

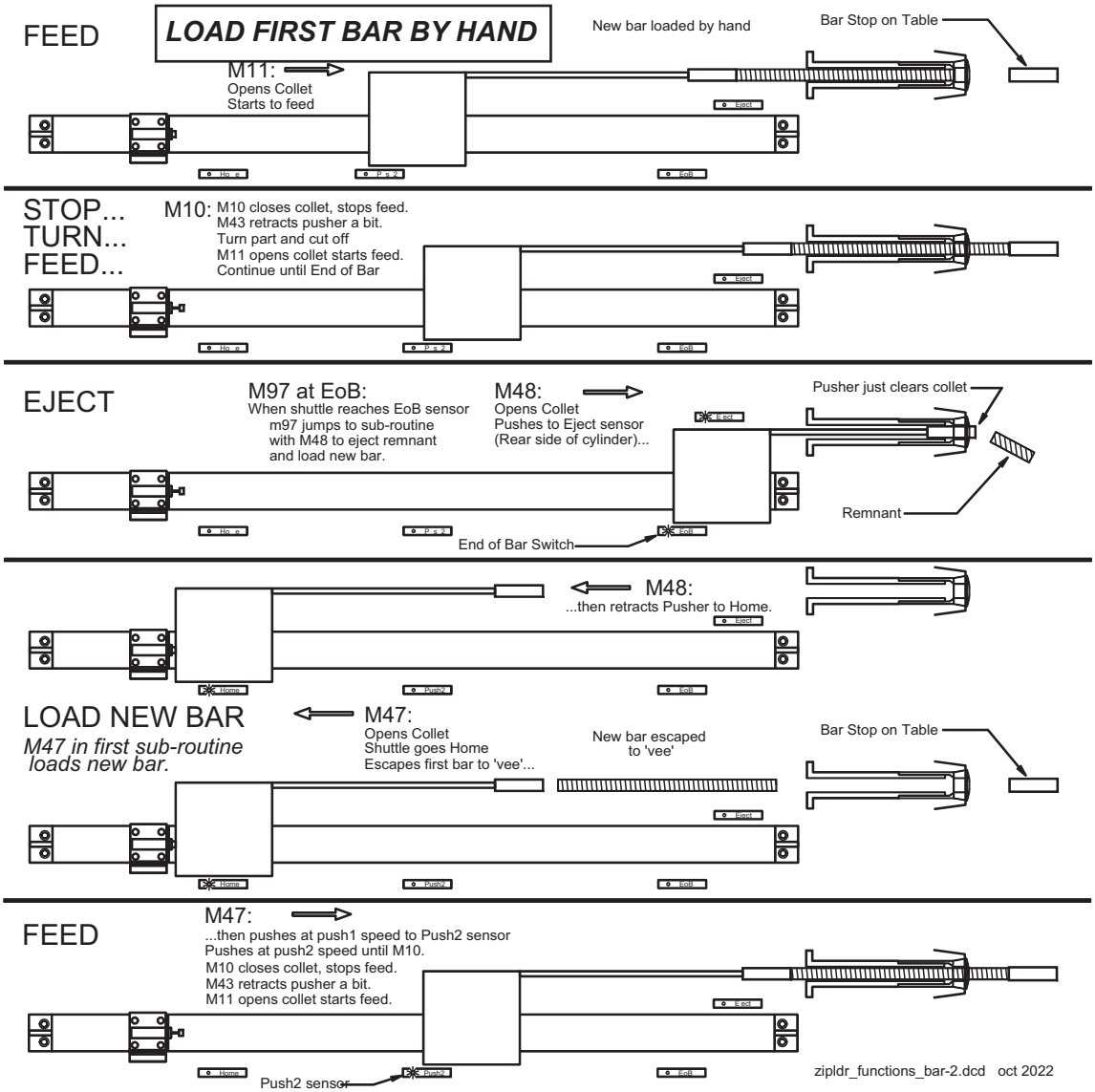


Refer to the illustration above.

1. **Bar Stop (1):** This is a hard stop mounted at a tool position on the tooling plate (table) of the Omni-Turn. This stop must be located near the collet then pulled back as the bar feeds so the conditional sub-routine M97 can check for End of Bar sensor (next page, #7).
2. **Spindle Liner (2):** The liner should be .020 - .040 larger than the bar to insure vibration-free operation and reliable feeding.
3. **Pusher (3):** The pusher should be about the same size as the bar. The Pusher rides on the 'vee' of the Loader and guides the bar into the liner. It is pressed onto the push-rod and held by a barb.
4. **Home Stop (4):** The Home Stop is clamped to the Rodless Cylinder with cap-screws. It mounts a shock absorber that the shuttle contacts when at "home". For most bar work, the Home Stop will be set almost to the far left end of the Rodless Cylinder. It should be set so that the Pusher just clears the end of the bar when at Home.
5. **Home Sensor (5):** The Home Sensor must light when the shuttle is at the Home Stop with the shock absorber compressed. The sensor is held in place with a tiny screw. Do not over-tighten the screw as this may damage the sensor.
6. **End of Bar (EoB) Sensor (6):** The EoB sensor should be set to leave minimum remnant. When the shuttle lights the EoB sensor, the face of the pusher should be about 1/2 to 1" inside the collet.
7. **Push2 Sensor (7):** When the shuttle crosses the Push2 sensor loading new bar, the pusher speed is controlled by the setting of the Push2 flow control. (see page 6). Depending on the material, the Push2 feed might be faster or slower than the Push1 feed. The two feed rates are independent, switching when the shuttle crosses the Push2 sensor. *To prevent speed change at sensor, put M57 after M50 on a block by itself.*
8. **Eject Sensor (8):** The Eject Sensor is mounted at the right of the End of Bar sensor. It must light when the shuttle is up against the far right end of the Rodless Cylinder. *NOTE:* If diameter of bar is less than 1/8", *Inertial Eject* can be used to eject the remnant w/o needing to turn down the push-rod to clear the sensor. *See Page 36.* The pushrod can be shortened to prevent hitting the collet, or the eject sensor can be set to the left so stock pushrod stops before hitting back of collet.

The illustration on the next page shows the operation of the ZipLoader in "Bar" mode. The M-functions are described with programming tips.

Bar Mode (M50) Operation and M-functions



Refer to the illustration above.

1. **Mode Set - M50:** The “Bar” mode is ZipLoader default, but for consistency with the other modes you should put M50 in a block by itself just below the program header, and comment it (Bar Mode).
2. **Open Collet & Feed - M11:** Put M11 in the block following the bar stop location, to open the collet and start feeding bar. Allow some time (G04) after M11 for the bar to contact the bar stop.
3. **Close Collet & Stop Feeding - M10:** When the bar is at the bar stop issue M10 to close the collet and stop feeding.
4. **Retract briefly - M43:** Put M43 in the block following M10. This will retract the pusher a bit so it doesn’t rest against the bar during machining.
5. **Load New Bar - M47:** M47 loads a new bar. Load very first bar by hand; this allows you to shut down with partial bar in collet. Put M47 in first sub-routine, which is called by M97.
6. **Eject Remnant - M48:** M48 ejects remnant and returns shuttle to home. Put M48 in the first sub-routine which is called by M97. *NOTE:* If diameter of bar is less than 1/8”, *Inertial Eject* can be used to eject the remnant w/o needing to turn down the pushrod to clear the sensor. See Page 36.
7. **EoB Sub-Routine - M97:** Put M97 block between opening collet to feed (M11) and closing collet (M10). M97 is conditional jump to sub-routine. If shuttle crosses EoB sensor after M11, program will jump to first sub-routine to eject remnant and load new bar. If shuttle crosses EoB sensor while in first sub-routine, second sub-routine will run, halting program and signaling “no more bars in tray”.

Examine the sample program on next page. Use this as a template for your own programs.

Bar Mode (M50) *Programming*

Use M50 to set Bar mode; M11 to open collet and feed loaded bar. (Load first bar by hand)
Use M97 to check for End of Bar, and to check for no bar (empty magazine).
Use M10 to clamp collet and stop feed
Use M43 to move the pusher off the back of the part.
In sub-routine: use M48 to eject remnant; M47 to load new bar

Sample program barload: **NOTE:** ***All moves are zero;*** use appropriate numbers for your part

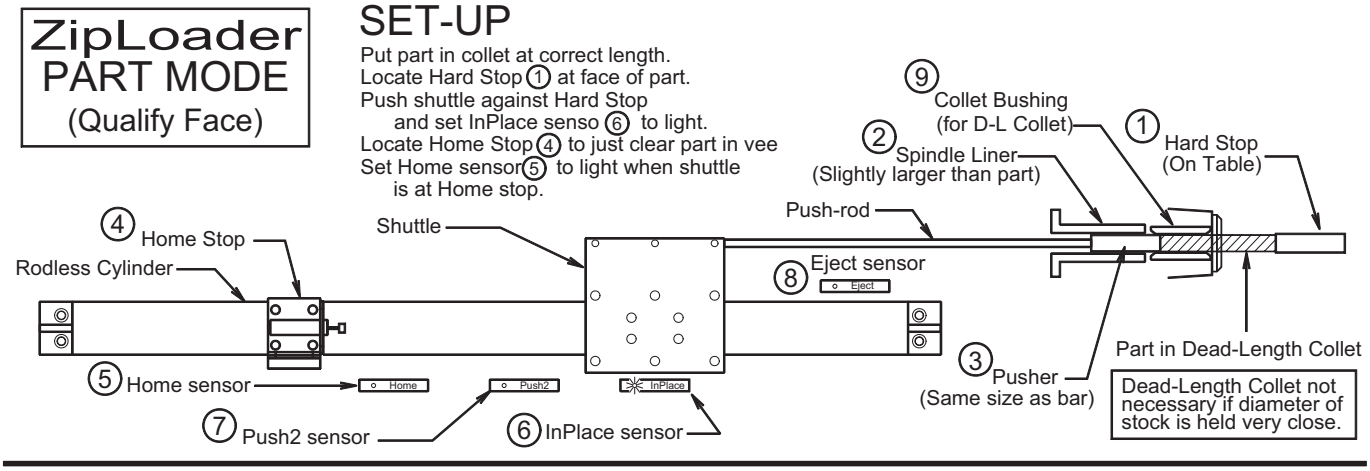
g90g72g94f300	Header information (absolute, diameter, feed ipm, 300ipm)
m50 (bar mode)	Sets the ZipLoader mode to “Bar”
t1(bar stop)	Call bar stop
x0z-0 (Z minus)	Locate near collet; minus Z relative to face of part
m11 (open collet and feed)	This block opens collet and feeds bar to bar stop at speed set by Push2 flow control; to feed at Push1 speed add m57 on a block by itself after m50
z0f20 (feed out slowly)	Move back slowly as bar feeds to insure EoB sensed properly
m97i10c1p1 (if EoB do sub 1)	If pusher has reached End of Bar program jumps to Sub1
g04f.1 (short dwell)	Delay to read PLC
m10 (clamp collet)	If not EoB, the collet will clamp, and pusher will stop
m97i10c1p1 (if EoB do sub 1)	With very short parts, EoB sensor can ‘flicker’ after first m97 is read. This second m97 insures that EoB ‘flag’ is read by CNC.
m43 (retract pusher)	Moves the pusher away from the back of the part
t2	Your first cutting tool
x0z0	All your machining goes here
m30	End of main program
}1 (sub 1: new bar)	This subroutine is called by first m97 block (load new bar)
x0z0 (move out of way)	This moves tools away to allow remnant to eject
m48 (eject remnant)	M48 opens collet, pushes remnant out at Push1 speed, and goes home. To eject at Push2 speed, put m59 on a block by itself just before m48.
t1	Call bar Stop
x0z-0 (Z minus)	***Same location as in main program, above***
m47 (load new bar)	Loads new bar
g04f3 (long dwell)	***Must allow time for shuttle to reach EoB if tray is empty***
m97i10c1p2 (if EoB do sub 2)	If pusher reaches End of Bar again programs jumps to fault
g04f.1 (short dwell)	Delay to read PLC
m99 (sub end)	*Returns program to block immediately after m97i10c1p1*
}2 (sub 2: no more bars)	This subroutine is called by second m97 block (no more bars)
m11 (open collet and feed)	Shuttle will feed to eject sensor, causing fault (no more bars)
m31 (cancel cycle repeat)	Cancels cycle repeat
m30 (no more bars)	End of program
m99 (sub end)	Required to close subroutine

NOTES:
After subroutine, program returns to block immediately following subroutine call. If no bar is loaded after ejecting remnant (tray is empty), the second subroutine issues m11 to open collet and feed. Shuttle will push to Eject sensor, which results in a ‘fault’, causing the PLC to stop the program and light the red stack-lamp.

If a second feed is necessary, a third subroutine should be added. Put an m97 with “p3”and g04f.1 after second m11. The third subroutine should be same as the first, except add m30 before m99. This insures that the program starts at the beginning rather than at the line after the subroutine is called. If there are no more bars, sub1 will be called, then sub2, causing “no more bars” fault.

If bar diameter is less than 1/8”, use Inertial Eject (see page 36). Add m43 and m59 before m48 in sub 1. Edit m43 (see page 35) to retract shuttle about 2” past Eject sensor. Eject sensor must be moved left so pushrod doesn’t bang into back of collet.

Part Mode (M51) Component Parts and Setup

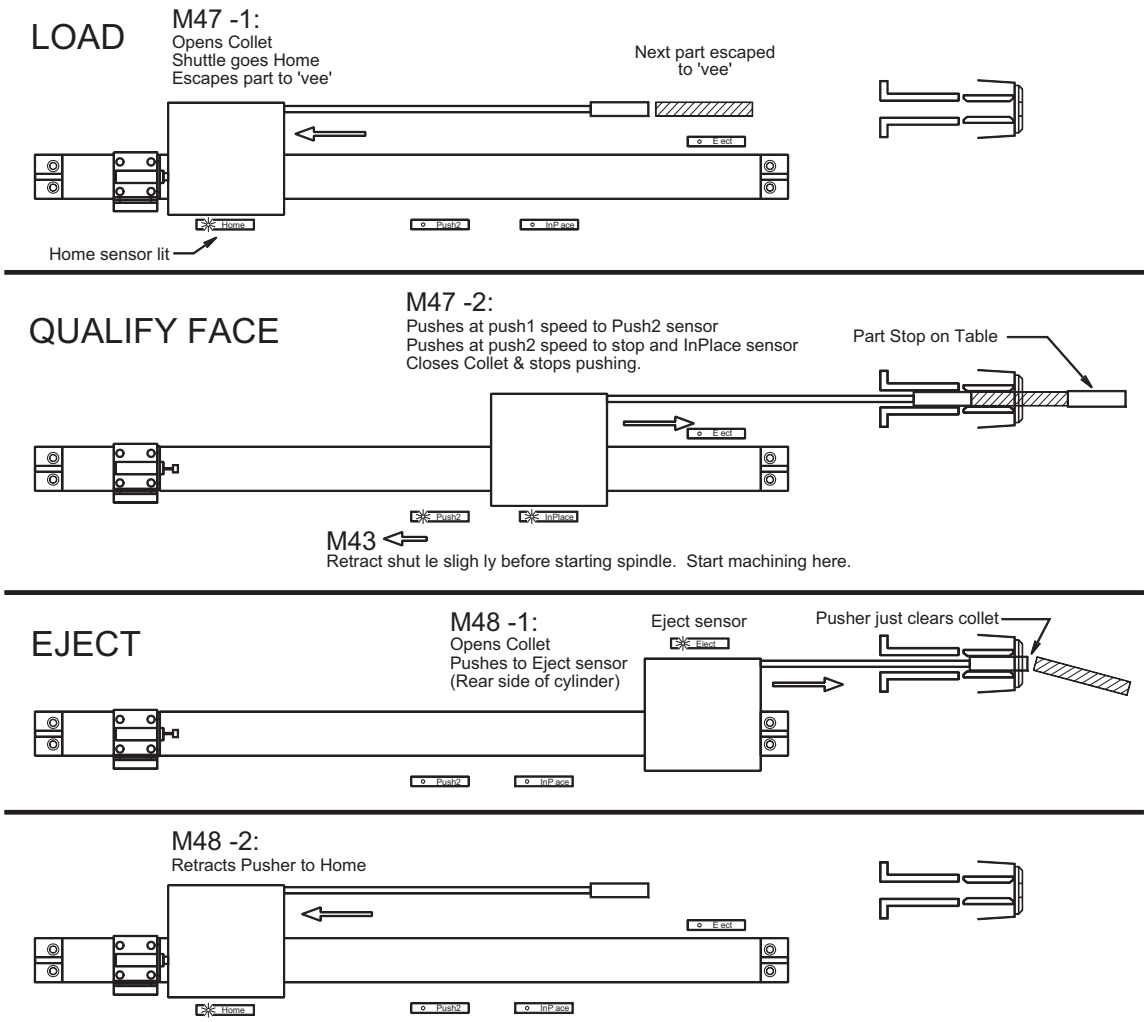


Refer to the illustration above.

1. **Hard Stop (1):** As with “Bar Mode” this is a hard stop mounted at a tool position on the tooling plate (table) of the OmniTurn.
2. **Spindle Liner (2):** The liner should be .020 - .040 larger than the bar to insure vibration-free operation and reliable feeding.
3. **Pusher (3):** The pusher should be about the same size as the bar. The Pusher rides on the ‘vee’ of the Loader and guides the bar into the liner. It is pressed onto the push-rod and held by a barb.
4. **Home Stop (4):** The Home Stop is clamped to the Rodless Cylinder with 4 button-head screws. It mounts a shock absorber that the shuttle contacts when at “home”. For shortest cycle times set the Home Stop so that the Pusher just clears the end of the part when at Home.
5. **Home Sensor (5):** The Home Sensor must light when the shuttle is at the Home Stop with the shock absorber compressed. The sensor is held in place with a tiny screw. Do not over-tighten the screw as this may damage the sensor.
6. **InPlace Sensor (6):** The In Place Sensor signals the PLC to close the collet and stop pushing. If the shuttle doesn’t reach the In Place sensor within 5 seconds after passing Push2 sensor, the loader will fault; part could be too long. If the shuttle passes the In Place sensor the loader will fault; no part or part too short.
7. **Push2 Sensor (7):** When the shuttle crosses the Push2 sensor, the pusher speed changes to the setting of the Push2 flow control (see page 6). For shortest cycle times locate this sensor about two inches from InPlace, and set the Push2 speed slow enough to not hit stop too hard. To *not* change speed at Push2 sensor, put m57 on a block by itself after m51.
8. **Eject Sensor (8):** The Eject Sensor is mounted on the far side of the Rodless Cylinder. It should light when the shuttle is up against the far right end of the cylinder. *NOTE:* If diameter of bar is less than 1/8”, *Inertial Eject* can be used to eject the remnant w/o needing to turn down the pushrod to clear the sensor. *See Page 36.* The pushrod can be shortened to prevent hitting the collet, or the eject sensor can be set to the left so stock pushrod stops before hitting back of collet.
9. **Collet Bushing (9):** If Dead-Length collet is required, the liner must be shortened because the i.d. of D-L collet is only 3/4”. Short parts might require a delrin bushing from 3/4 stock installed in collet to guide the part. For small diameter parts, liner with 0.725 diameter nose can be special ordered.

The illustration on the next page shows the operation of the ZipLoader in “Part” mode. The M-functions are described with programming tips.

Part Mode (M51) *Operation and M-functions*



Refer to illustration above.

1. **Mode Set - M51:** Put M51 in a block by itself at top of program and comment it (Part Mode).
2. **Load Part & Qualify at face - M47:** M47 loads next part as illustrated in M47-1 & M47-2 above. Locate the part stop then issue M47. ZipLoader automatically opens collet, escapes next part to 'vee', and pushes part to stop. InPlace sensor should light at this point, which signals ZipLoader to automatically close collet and stop pushing. M43 retracts shuttle slightly from rear of part.
3. **"No Part" Time-out:** If there is no part in collet, shuttle will pass InPlace lamp causing ZipLoader to fault, which lights stack-lamp and stops program. **NOTE:** *If o/a length of parts varies more than about 1/4", the loader will fault because that is the limit of the senor range.* To load parts with such length variations, use Bar Mode. Add sufficent dwell after m47 to insure part is at stop before m10 (close collet/stop feed).
4. **Eject - M48:** Issue M48 after machining to eject finished part and retract pusher to home. *NOTE:* If parts are delicate, use m59 just before m48 in program to enable Push2 eject. If diameter of parts is less than 1/8", *Inertial Eject* can be used to eject the remnant w/o needing to turn down the pushrod to clear the sensor. See Page 36.
5. **Unload - M25:** If parts are long, or delicate or need to be dropped onto conveyor, use optional table-mounted unloader (792-39-100) to receive part, then transfer it to optional conveyor (499-39-100).

Part Mode (M51) Programming

VERY IMPORTANT:
(1) Part stop must be in position before M47.
(2) "In Place" sensor should light about .050" before face of part hits hard stop.
(3) The spindle is started after M47, and stopped before M48. Do not start spindle before M47! Do not issue M48 with spindle running!*
(4) Use M43 after the part is loaded to retract the pusher slightly so it doesn't rub on the back of the part.

Sample program partload: NOTE: All moves are zero; use appropriate numbers for your part

g90g72g94f300 . . . . . .Header information (absolute, diameter, feed ipm, 300ipm)
m51 (part mode) . . . . . .Sets the ZipLoader mode to "Part"; to prevent Push2 speed during feed, put m57 on next block.
t1 (part stop) . . . . . .Part stop on tooling plate
x0z0 . . . . . .Locate part stop at face of part
m47 (load new part). . . . . .Load new part and close collet
m43 (retract pusher) . . . . . .Move the pusher away from the back of the part

t2 Your first cutting tool
x0z0 . . . . . .All your machining goes here

m48 . . . . . .M48 opens collet, pushes remnant out at Push1 speed, and goes home. To eject at Push2 speed, put m59 on a block by itself just before m48.

m30 . . . . . .End of program

*Spindle can be turning slowly; experiment to see how this works with your parts.

Inertial Eject:
For parts that are smaller than 1/8" diameter, that is, smaller than the smallest standard pusher, normal eject cycle cannot be used because the pusher cannot pass through the collet. It is not impossible to turn down the end of the pusher, but an "inertial eject" can be used instead. The eject cycle (m48) opens the collet, pushes until the Eject sensor lights, then retracts to Home and stops. The eject speed is Push1 speed by default, but Push2 speed can be selected by putting m59 on a block before m48. For inertial eject, Push2 speed is set much faster than Push1, and the Eject sensor is moved to the left so that the pushrod doesn't hit the back of the collet. Because Push2 speed is set too fast for loading, it is necessary to prevent Push2 sensor from changing speed. To do this, put m57 on a block by itself just after m51. For more about inertial eject see page 36.

Blank Length Variation:
If the o/a length of the blanks varies by more than about 1/4" Part Mode cannot be used because the InPlace sensor range is about 1/4". Bar Mode can be used, but sufficient dwell (g04) must be put on a block between m47 (escape part to vee and push) and m10 (close collet and stop pushing). Inertial eject can be used, as described above. Program blocks to use bar mode to load parts looks like this:

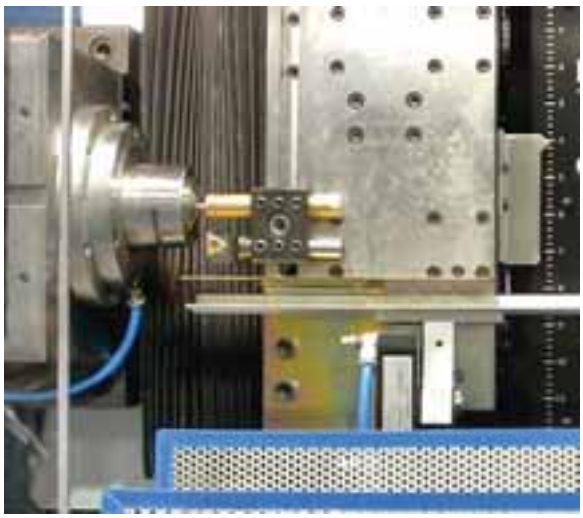
g90g72g94f300 . . . . . .Header information (absolute, diameter, feed ipm, 300ipm)
m50 (bar mode). . . . . .Sets the ZipLoader mode to "Bar"; to prevent Push2 speed during feed, put m57 on next block.
t1 (part stop) . . . . . .Part stop on tooling plate
x0z0 . . . . . .Locate part stop at face of part
m47 (load new part). . . . . .Load new part and close collet
g04fn . . . . . .Sufficient dwell for part to locate against part stop
m10 . . . . . .Close collet and stop pushing
m43 (retract pusher) . . . . . .Move the pusher away from the back of the part.

t2 . . . . . .Your first cutting tool
x0z0 . . . . . .All your machining goes here

m48 . . . . . .M48 opens collet, pushes remnant out at Push1 speed, and goes home. To eject at Push2 speed, put m59 on a block by itself just before m48.

m30 . . . . . .End of program

Using Part-Mode (M51)



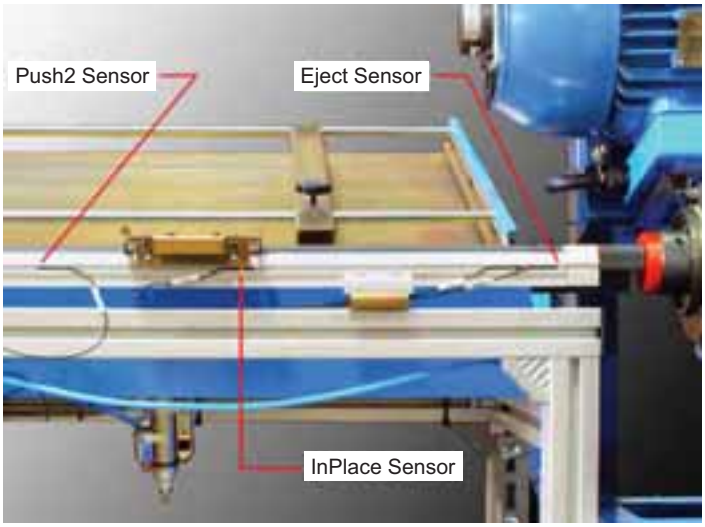
Locating parts for machining:
The **Hard Stop** locates the face of the part push-rod precisely and repeatedly; the **Shuttle** pushes from the rear of the part to insure that the face of the part is securely against the hard stop. When running, the hard stop must be located in front of the collet before the part is delivered from the loader tray (m47). The load process is totally automated; the InPlace sensor on the rodless cylinder signals the PLC to close the collet, and stop pushing.

Locate Hard Stop

To Position the Stops:

1. Set the OmniTurn in Jog mode.
2. Locate the hard stop about where you want the face of the part
3. Set this as a tool number (you can adjust offsets precisely later)
4. Manually put a part into the liner.
5. Manually push the shuttle so part is against hard stop. Move the In Place sensor to the left toward the shuttle until LED lights. If you go past, move sensor to right until light goes out, then move left again (this overcomes the magnetic 'hysteresis').

Locate InPlace Switch



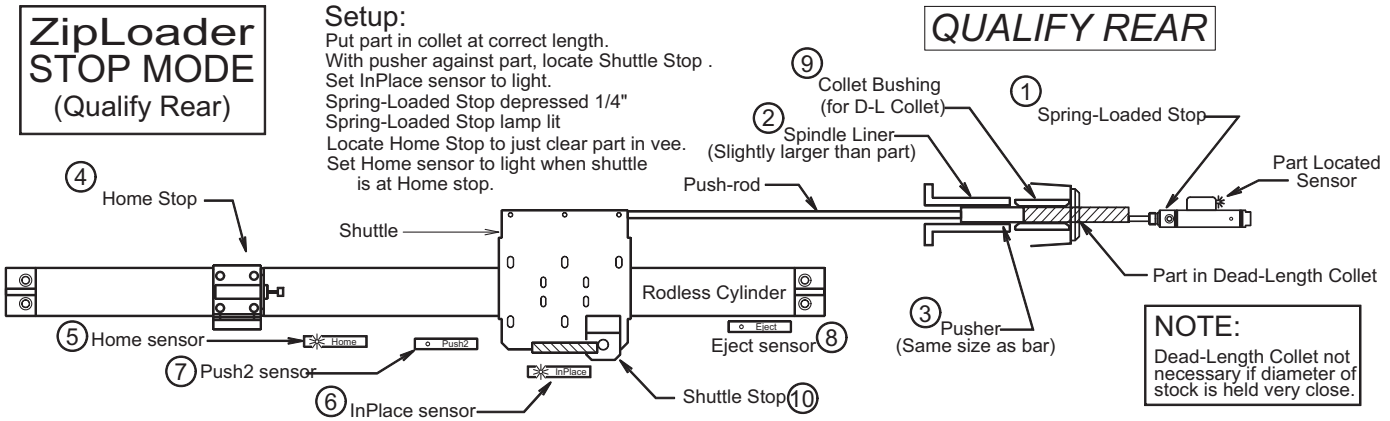
Magnetic Sensors:

PUSH2: The Push2 sensor signals the PLC to change to slower speed so part does not hit hard stop too hard. For inertial eject, Push2 speed should be set faster than Push1, and m57 used to prevent speed change at Push2 sensor. See previous page, and page 36 for inertial eject description. Adjust Push2 flow control as required (see page 6).

IN PLACE: This sensor signals the PLC that part is against hard stop. Collet is closed and rodless cylinder stops pushing. If o/a length of blanks varies by more than about 1/4", use bar mode as described on previous page.

EJECT: This sensor should light when the shuttle is at far right on rodless cylinder. Pusher tip must clear the collet, allowing the part to fall free. Should never need adjustment. If inertial eject is used, eject sensor must be moved to left to prevent pusher from hitting back of collet too hard.

Stop Mode (M52) Component Parts and Setup

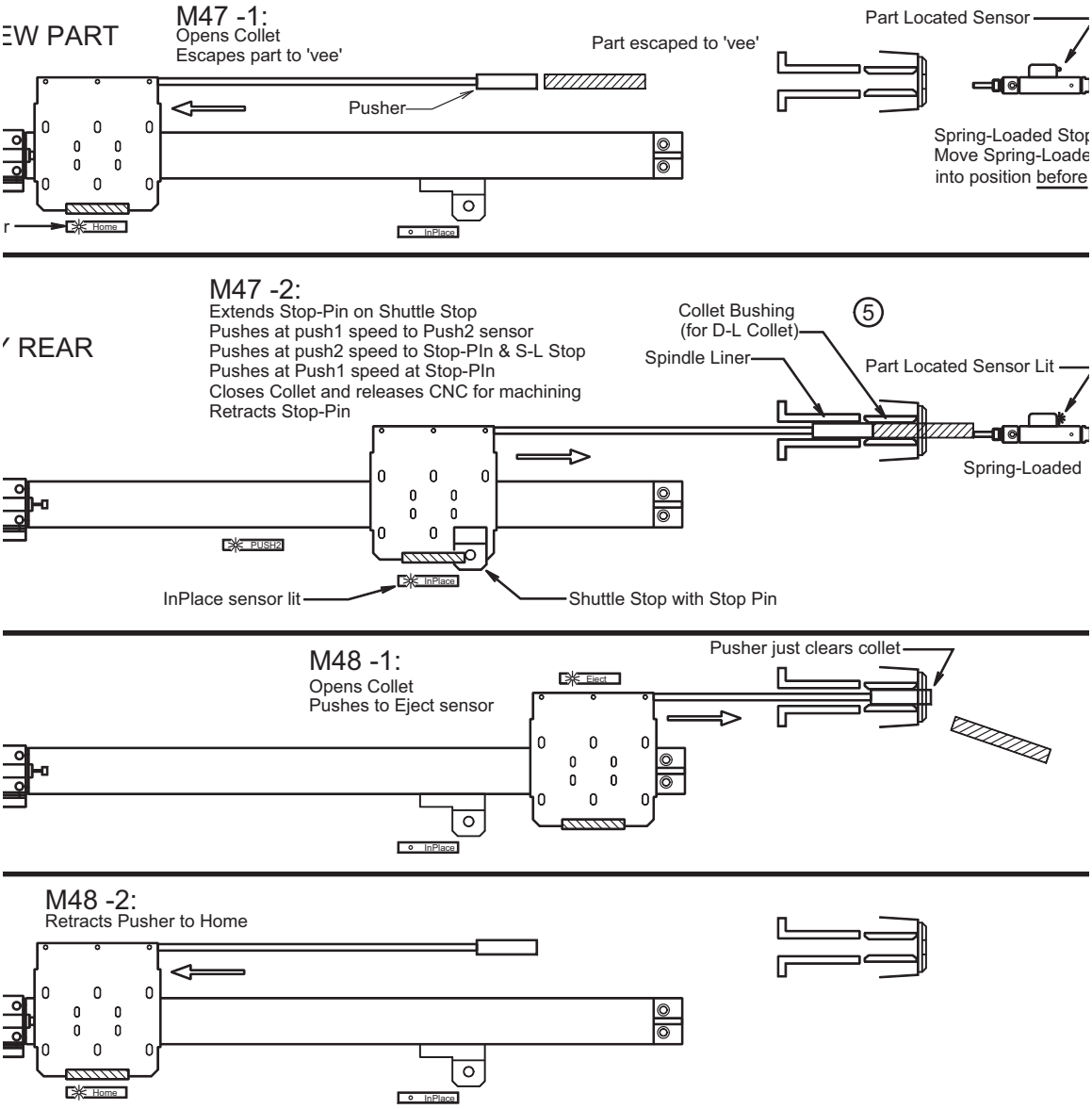


Refer to the illustration above.

1. **Spring-Loaded Stop & Part Located Sensor (1):** The spring-loaded stop holds the part against the push-rod while the collet is closed. The stop (and Shuttle Stop) automatically extends with M47, and retracts when load is complete. For setup, use M45 to extend this stop and the Shuttle Stop (10); use M46 to retract. Move stop into place before M47. Set the tool so that the spring is compressed about .050 - .200". Loosen band holding sensor, and adjust so the lamp lights when the spring is compressed this amount, but doesn't light if not compressed. This provides "no part in collet" fault.
2. **Spindle Liner (2):** The liner should be .020 - .040 larger than the bar to insure vibration-free operation and reliable feeding.
3. **Pusher (3):** The pusher should be about the same size as the bar. The Pusher rides on the 'vee' of the Loader and guides the bar into the liner. It is pressed onto the push-rod and held by a barb.
4. **Home Stop (4):** The Home Stop is clamped to the Rodless Cylinder with cap-screws. It mounts a shock absorber that the shuttle contacts when at "home". For shortest cycle times set the Home Stop so that the Pusher just clears the end of the part when at Home.
5. **Home Sensor (5):** The Home Sensor must light when the shuttle is at the Home Stop with the shock absorber compressed. The sensor is held in place with a tiny screw. Do not over-tighten the screw as this may damage the sensor.
6. **InPlace Sensor (6):** The In Place Sensor signals the PLC to close the collet and stop pushing. If the shuttle doesn't reach the In Place sensor within 5 seconds after passing Push2 sensor, the loader will fault; part could be too long. If the shuttle passes the In Place sensor the loader will fault; no part or part too short.
7. **Push2 Sensor (7):** When the shuttle crosses the Push2 sensor, the pusher speed is controlled by the setting of the Push2 flow control (see page 6). For shortest cycle times locate this sensor about two inches from InPlace, and set the Push2 flow control to slow shuttle to not hit stop too hard.
8. **Eject Sensor (8):** The Eject Sensor is mounted near the far right of the Rodless Cylinder. It must light when the shuttle is at the far right end of the cylinder. If not, loader will fault after M48 (eject remnant).
9. **Collet Bushing (9):** If Dead-Length collet is required, the liner must be shortened because the i.d. of D-L collet is smaller than standard. Make a delrin bushing from 3/4 stock and put it in collet to guide part. For small diameter parts, liner with 0.725 diameter nose can be special ordered.
10. **Adjustable Shuttle Stop on Rodless Cylinder (10):** The Shuttle Stop is set so that when the pusher is against extended shot pin with a part in the collet, the part is correctly located for mahining. Z-axis tool offsets will be used to achieve precise overall length. The shot-pin automatically extends with M47, then retracts when load is complete.

The illustration on the next page shows the operation of the ZipLoader in "Stop" mode. The M-functions are described with programming tips.

Stop Mode (M52) Operation and M-functions



Refer to illustration above.

1. **Mode Set - M52:** Put M52 in a block by itself at top of program and comment it (Stop Mode).
2. **Load Part & Qualify at rear - M47:** M47 loads next part as illustrated in M47-1 & M47-2 above. Locate the spring-loaded stop and issue M47. ZipLoader automatically opens collet, escapes next part to 'vee', extends stops, and pushes part to shuttle-stop. InPlace and Part Located LEDs should light at this point, which signals ZipLoader to automatically close collet and stop pushing.
3. **"No Part" Time-out:** If there is no part in collet, Part Located sensor will not light, causing ZipLoader to fault, which lights red stack-lamp and stops program. **NOTE:** If o/a length of parts varies more than about 1/4", the loader will fault because that is the limit of the senor range. To load parts with such length variations, use Bar Mode. Add sufficent dwell after m47 to insure part is at stop before m10 (close collet/stop feed).
4. **Retract Briefly - M43:** Issue M43 after M47 to move the pusher away from the rear of part.
5. **Eject - M48:** Issue M48 after machining to eject finished part and retract pusher to home. *NOTE:* If parts are delicate, use m59 just before m48 in program to enable Push2 eject. If diameter of parts is less than 1/8", *Inertial Eject* can be used to eject the remnant w/o needing to turn down the pushrod to clear the sensor. See Page 36.
6. **Unload - M25:** If parts are long, or delicate or need to be dropped onto conveyor, use optional table mounted unloader (792-39-100) to receive part, then transfer it to optional conveyor.

Stop Mode (M52) *Programming*

VERY IMPORTANT:

(1) Spring-loaded stop must be in position before M47.
(2) With shuttle at shuttle stop and part in liner, spring-loaded stop should compress about 0.075".
(3) "In Place" sensor should light about .100" before shuttle dog hits shuttle stop pin.
(4) The spindle is started after M47, and stopped before M48. Do not issue M48 with spindle running.
(5) Use M43 after the part is loaded to retract the pusher slightly so it doesn't rub on the back of the part.

Sample program stopload: NOTE: All moves are dummy; use appropriate numbers for your part

```
g90g72g94f300 . . . . . Header information (abs mode, dia mode, feed ipm, 300ipm)
m52 (stop mode) . . . . . Stop Mode enabled
t1 (spring-loaded stop)  . . . . Spring-loaded stop on tooling plate
x0z0 . . . . . Locate part stop at face of part
m47 (load new part). . . . . Load new part and close collet: InPlace & Part Located lit
m43 (retract pusher) . . . . . Move the pusher away from the back of the part
m03s4000 . . . . . Start spindle
t2 . . . . . Your first cutting tool
x0z0 . . . . . All your machining goes here
m05 . . . . . Stop spindle
m48 . . . . . Eject part to unloader
m30 . . . . . End program
```

Inertial Eject:

For parts that are smaller than 1/8" diameter, *ie*, smaller than the smallest standard pusher, normal eject cycle cannot be used because the pusher cannot pass through the collet. It is not impossible to turn down the end of the pusher, but an "inertial eject" can be used instead.

The eject cycle (m48) opens the collet, pushes until the Eject sensor lights, then retracts to Home and stops. The eject speed is Push1 speed by default, but Push2 speed can be selected by putting m59 on a block before m48.

For inertial eject, Push2 speed is set much faster than Push1, and the Eject sensor is moved to the left so that the pushrod doesn't hit the back of the collet.

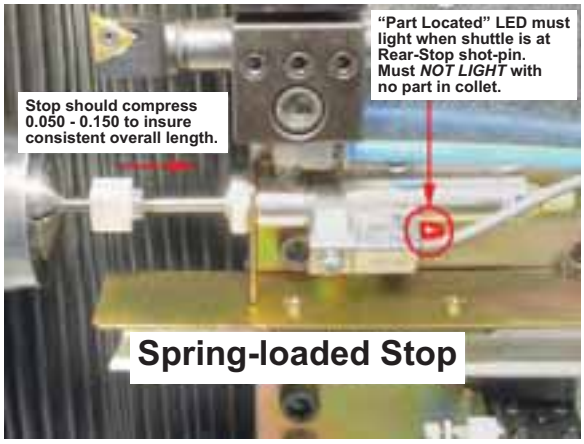
Because Push2 speed is set too fast for loading, it is necessary to prevent Push2 sensor from changing speed. To do this, put m57 on a block by itself just after m52.

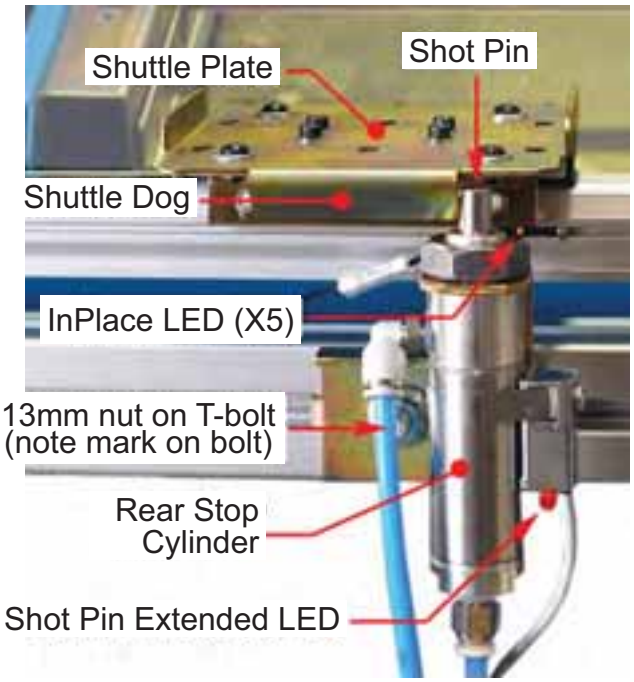
For more about inertial eject see page 36.

Using Stop Mode (M52) Qualify Parts for Overall Length

Locating parts for machining:

The Rear Stop shot-pin locates the shuttle precisely and repeatedly; the Spring-Loaded Stop pushes from the front of the part to insure that the back of the part is against the push-rod. In your part program, the Spring-Loaded Stop must be at the collet before M47. The Part Located and InPlace sensors signal the PLC to close the collet and stop pushing.
Loader will fault if these sensors don't light within about ten seconds after M47.





To Position the Stops:

1. Set the OmniTurn in MDI mode.
2. *Insure that the shuttle is to the left of shuttle stop pin.*
3. Issue M45 to extend both stops.
4. Manually put a part into the liner.
5. Manually push the shuttle so dog is about .050-.100" from shuttle stop pin. Verify that In Place LED lights. If not, loosen tiny screw and slide sensor to left until lamp lights. If you go past, move sensor to right until light goes out, then do it again.
6. Issue M49 to press shuttle dog against pin.
7. Set the OmniTurn to Jog mode: Jog the tooling plate in X and Z so that tip of spring-loaded stop is compressed about .050 - .150". Loosen screw on band, and adjust sensor on cylinder so "Part Located" LED is lit. Jog away from the part and insure that the LED is *NOT LIT* when the part is not touching the stop.
8. Assign Spring-Loaded stop a tool offset number.
9. Issue M44 to stop pushing.

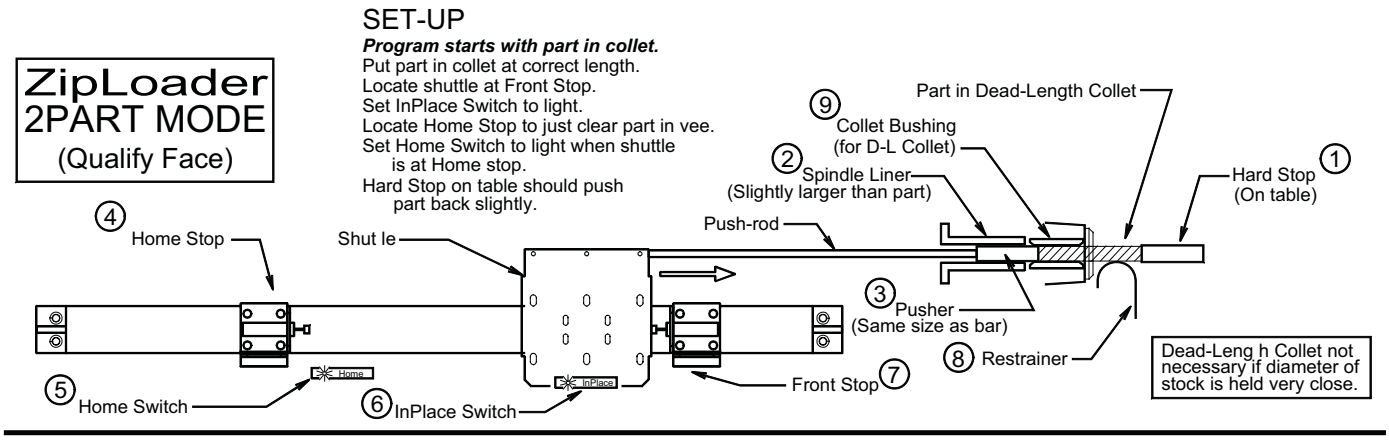
Sensors:

IN PLACE: This sensor signals the PLC that shuttle has stopped at shuttle stop. Loader will fault if this sensor doesn't light within about ten seconds after M47 (load).

PART LOCATED: Mounted on spring-loaded cylinder on tooling plate, this sensor signals the PLC that there is a part in the collet. Loader will fault if this sensor doesn't light within about ten seconds after M47 (load).

EJECT: This sensor must light when the pusher tip is about 3/4" from back of the collet. Loader will fault if this sensor doesn't light within about three seconds after M48 (eject).

2Part Mode (M53): Qualify Face Component Parts and Setup



Refer to the illustration above.

1. **Hard Stop:** This is a hard stop mounted at a tool position on the tooling plate (table) of the OmniTurn. The “Restrainer” (8) stops the new part after finished part is ejected; use the hard stop to press against face of new part. Stop must push part back against pusher to insure location.
2. **Spindle Liner:** The liner should be .020 - .040 larger than the bar to insure vibration-free operation and reliable feeding.
3. **Pusher:** The pusher should be about the same size as the bar. The Pusher rides on the ‘vee’ of the Loader and guides the bar into the liner. It is pressed onto the push-rod and held by a barb.
4. **Home Stop:** The Home Stop is clamped to the Rodless Cylinder with cap-screws. It mounts a shock absorber that the shuttle contacts when at “home”. For shortest cycle times set the Home Stop so that the Pusher just clears the end of the part when at Home.
5. **Home Sensor:** The Home Sensor must light when the shuttle is at the Home Stop with the shock absorber compressed. The sensor is held in place with a tiny screw. Do not over-tighten the screw as this may damage the sensor.
6. **InPlace Sensor:** The InPlace Sensor must light when the shuttle is at Front Stop(7). This sensor releases the CNC to locate Hard Stop(1) at face of part. After Front Stop has been set (with part in collet), slide InPlace Sensor from right until it lights. Slide another .050” or so to insure that it will light. Do not over-tighten.
7. **Front Stop:** The adjustable Front Stop is set so that when the shuttle is pushing against it, the part in collet is correctly located for machining. (Z-Axis offsets are used to achieve precise length). If desired, use M49 from MDI to push against front stop; M44 stops pushing.
8. **Restrainer:** The spring-steel Restrainer should be located in X to provide just enough friction to limit over-travel of the next part. The Hard Stop is used to push the part back to qualify face.
9. **Collet Bushing:** If Dead-Length collet is required, the liner must be shortened because the i.d. of D-L collet is smaller than standard. Make a delrin bushing from 3/4 stock and put it in collet to guide part. For small diameter parts, liner with 0.725 diameter nose can be special ordered.

More detailed information regarding this optional mode of operation is available from the factory.

PLC Faults

Each event is timed, so a fault will occur if there is excess delay caused by a mis-feed or low air pressure.

If a fault occurs, PLC output Y7 is set, which pulls down Spindle Panel TB1-23 (G3 CNC) or Spindle CCA HDR108-1 & HDR104-1. This is 'soft' E-Stop: slide cannot be moved, spindle stops, all M-functions are reset and CNC drops out of Auto Mode. PLC Cabinet Reset/Initialize lamp will illuminate, as will Spindle Drive Cabinet Reset lamp, and red stack lamp; servos stay on.

Note: E-Stop or "door open" from CNC will fault PLC, but only if loader is in-cycle or pushing. X14 (door interlock OK) on PLC must be lit to allow operation.

To reset fault:
1 - Determine cause of fault.
2 - Press Reset/Initialize switch on PLC Cabinet to reset PLC and retract pusher to Home stop.
3 - Press "A" on CNC to re-enter Auto Mode.

PLC will fault as follows:

(M47)
If "Knife Down" (X2) is not lit. Immediate.
If "Home" (X3) is not lit within 3 seconds after M47.
If "Knife Up" (X1) is not lit within 2 seconds after "Home".
If "Push2" (X4) is not lit within 10 seconds after leaving "Home".
If "InPlace" (X5) doesn't light within 5 seconds after "Push2" (X4) in Part or Stop Mode.

(M11)
If "Eject" (X6) lights (no bar or no part).

(M48)
If "Eject" (X6) is not reached within 3 seconds after M48.
If "Home" (X3) is not reached within 3 seconds after "Eject" (X6).

(M56)
Force loader fault. This is useful for reinitializing the PLC.

PLC will "hang":
In rear qualify mode (M52), if "shot-pin up" sensor does not light. This can happen if clamping band of sensor is loose, and sensor slides down on the cylinder body.

To Restore PLC Program (**G4 CNC**):
1. At CNC 'splash' screen ("Please Backup Program Files" prompt), drop to DOS with Ctrl-C (press and hold Ctrl key, then press C key).
2. Set Run/Stop switch on PLC to Stop (down)
3. At K:CNC> prompt type UPDZIP then press enter.
4. Follow the on-screen prompts.
5. Note: If you see error message "Cannot communicate with PLC" your CNC may have VB7009 motherboard. These motherboards began shipping mid-2016. If this is the case, goto www.OmniTurn.com/bin/ plc_restore_vb7009.htm and follow those instructions.

To Restore PLC Program (**G3 CNC or earliest G4 w/floppy drive**)
1. There is a floppy in the PLC Cabinet. Put it in floppy drive, then perform step 1 above.
2. At C:\OMNITURN > (or K:\CNC> for earliest G4 CNC w/floppy) type A: then press Enter.
3. At A:\ prompt type PLCG3 (or PLCG4 for earliest G4 CNC) then press Enter.
4. Follow the on-screen prompts.

M-Functions

M-functions used in programs:
m10 (in bar mode): close collet and stop feed
m11 (in bar mode): open collet and start feed
m42: push2; for second feed, if necessary
m43: retract briefly *Note:m43 can be edited for more or less retract as required (see below)*
m47: load new bar or part
m48: eject bar or part and go home
m50: set bar mode
m51: set part mode
m52: set stop mode
m53: set 2part mode
m57: no push2 speed with m47
m59: push2 eject *Note: put on block just before m48*

M-functions used for setup:
m40: knife up
m41: knife down
m42: push at push2 speed *(use for second feed, part modes)*
m44: stop pushing *(use for second feed, part modes)*
m45: extend stops
m46: retract stops
m49: push at push1 speed
m56: force loader fault *(for troubleshooting; allows reset/initialize)*

To edit m43.usr: *(Retract shuttle)*
The m43 command can be edited to change the retract behavior.
To edit the m43 command follow these steps:
1 - At the CNC "splash" screen, press and hold the Ctrl key, then press "C" key (Ctrl-C).
2 - At the `K:\CNC>` prompt, type `C:` then press Enter
3 - At the `C:\RUNFILES>` prompt, type `EDIT M43.USR` then press Enter
4 - The standard program editor will open, with the m43.usr program displayed as shown below. Edit as required, then save & exit as usual.

```
clrb1
clrb3
setb2
delay.2
clrb2
end
```

The **.2** in this command is "point-two seconds"; change the number as required to get the retract distance you want. Note that retract distance will vary depending on location of the shuttle is when M43 is issued.

```
clrb1
clrb3
setb2
waiton3
clrb2
end
```

To send shuttle all the way to the home stop, change **delay.2** to **waiton3**, as shown at left

M97 - Jump to Sub-routine, Conditional

M97 is used to cause the part program to execute a sub-routine in response to an input from an external source, like a bar-feeder or auto-loader.

M97InCnPn
In is the PLC Input which is monitored (On the ZipLoader, PLC Input #10 is ON at End of Bar)
Cn is the Condition of the input to cause the jump: 1 (ON) or 0 (OFF)
Pn is the number of the sub-routine to execute

```
 code for program
        :
m97i10c1p2 (Execute Subroutine #2 when Input 10 turns on
        :
m30    (Or m02: end of program)
}1 code for subroutine #1
        :
m99    (End of sub routine)
}2 code for subroutine #2
        :
m99    (End of sub routine)
```

After the sub-routine completes (M99), the program resumes execution at the block immediately following the block that has the M97 that called the sub-routine. If the sub-routine includes M30, the program ends; if sub-routine includes M31, the program ends and Cycle Repeat is cancelled.

M57 & M59 - To Select Feed & Eject Speed

M57: Shuttle speed remains constant at speed set by Push1 flow control; Push2 sensor does not change shuttle speed. This feature allows Push2 speed to be set much faster than Push1 speed, to eject parts that have smaller diameter than pushrod without needing to turn down the pushrod tip to clear the collet. Put M57 near top of program on a block by itself.

M59: Default eject speed is the speed set by Push1 flow control. M59 selects speed set by Push2 flow control. Delicate parts sometimes benefit from slow eject speed, and parts smaller in diameter than the pushrod need fast eject speed to clear the collet while the pushrod stops behind the collet. Put M59 on a block by itself just before M48 selects the Push2 speed for eject.

Inertial Eject: Parts that are smaller in diameter than the pushrod can be ejected by inertia, without the need turn down the pushrod tip to clear the collet. For this application, Push2 speed is set much faster than the Push1 speed. The pushrod can be shortened to prevent hitting the collet, or the eject sensor can be set to the left so stock pushrod stops before hitting back of collet. Use M57 so the part can be loaded at the Push1 speed; use M59 to eject at Push2 speed. Edit M43.usr (see previous page) so shuttle will retract about two inches to left of Eject sensor. (Instead of editing M43, you can use two or more to retract sufficiently). M48 opens collet and pushes shuttle toward collet. When Eject sensor lights, shuttle will stop, then retract. Inertia will carry the part through the collet.

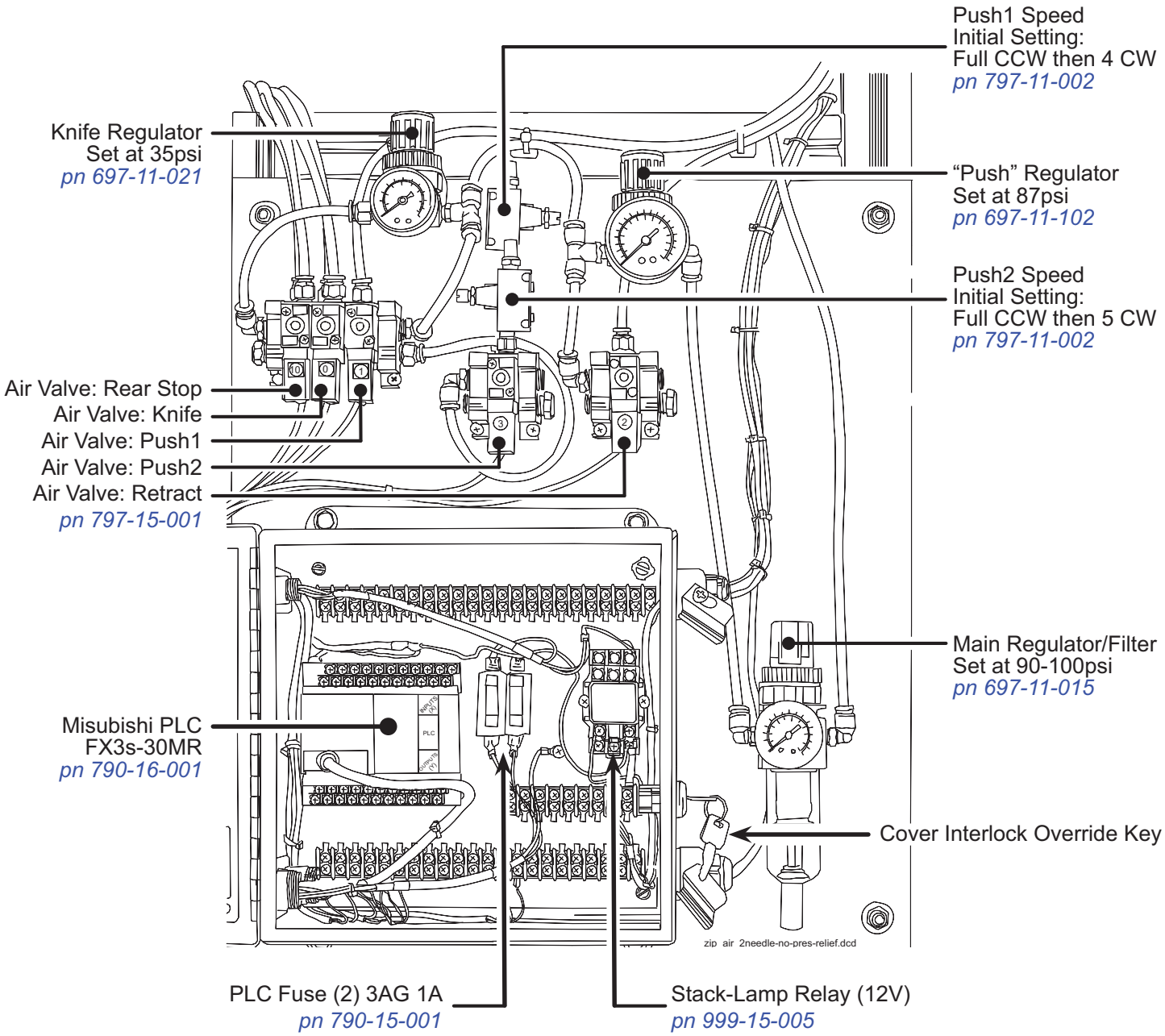
Lubrication

Only the rodless cylinder requres lubrication and that very seldom: every six months or 100,000 parts should be adequate.

To lubricate the rodless cylinder: shut off the air, remove the hoses from the push-lock fittings at the end of the cylinder and put a few drops of Mobil DTE Light (or equivalent) oil into the fitting.

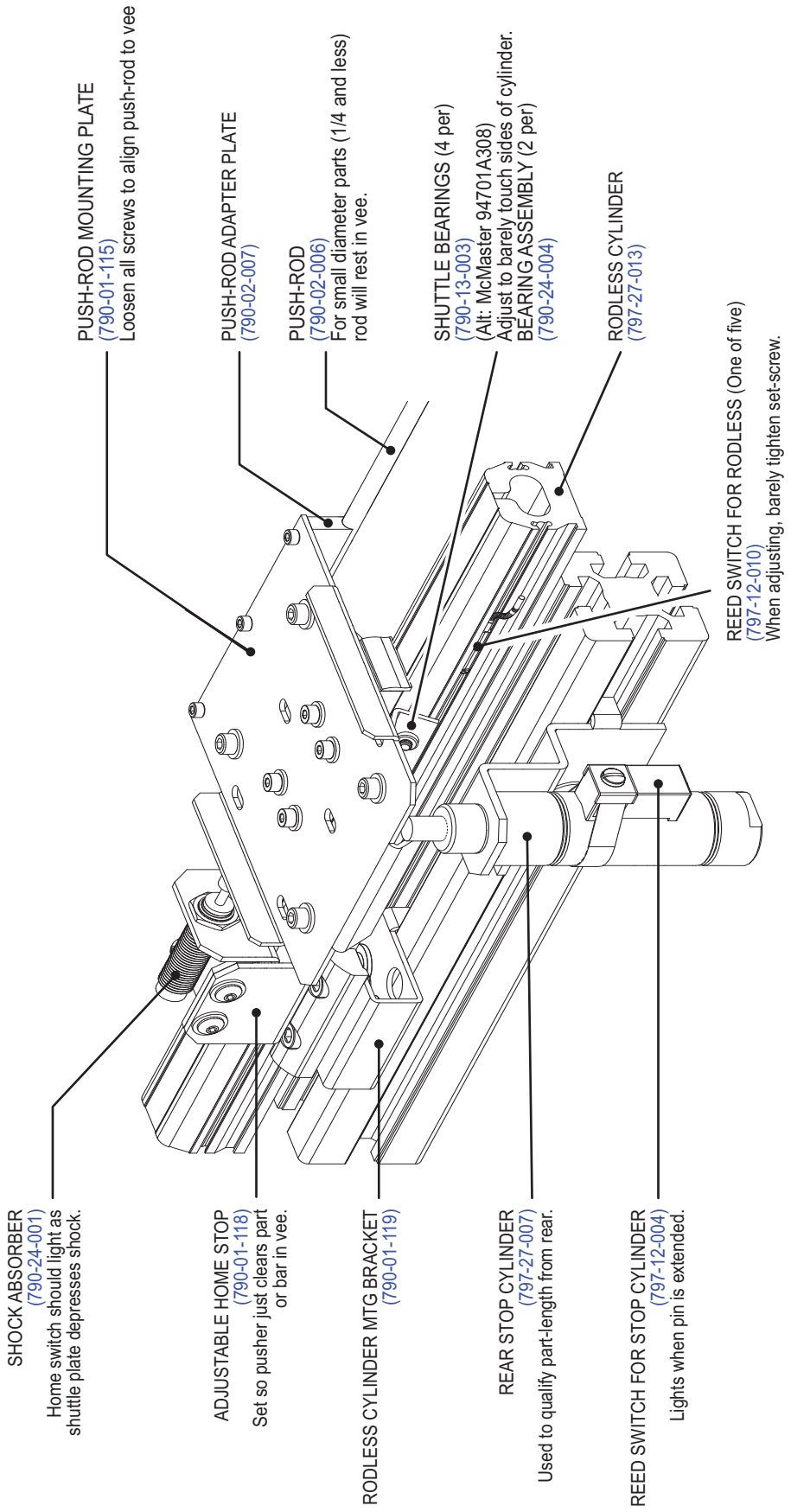
The knife is driven by a Bimba cylinder, and it rides on Igus slide bearings, neither of which require lubrication.

Air Panel Parts List

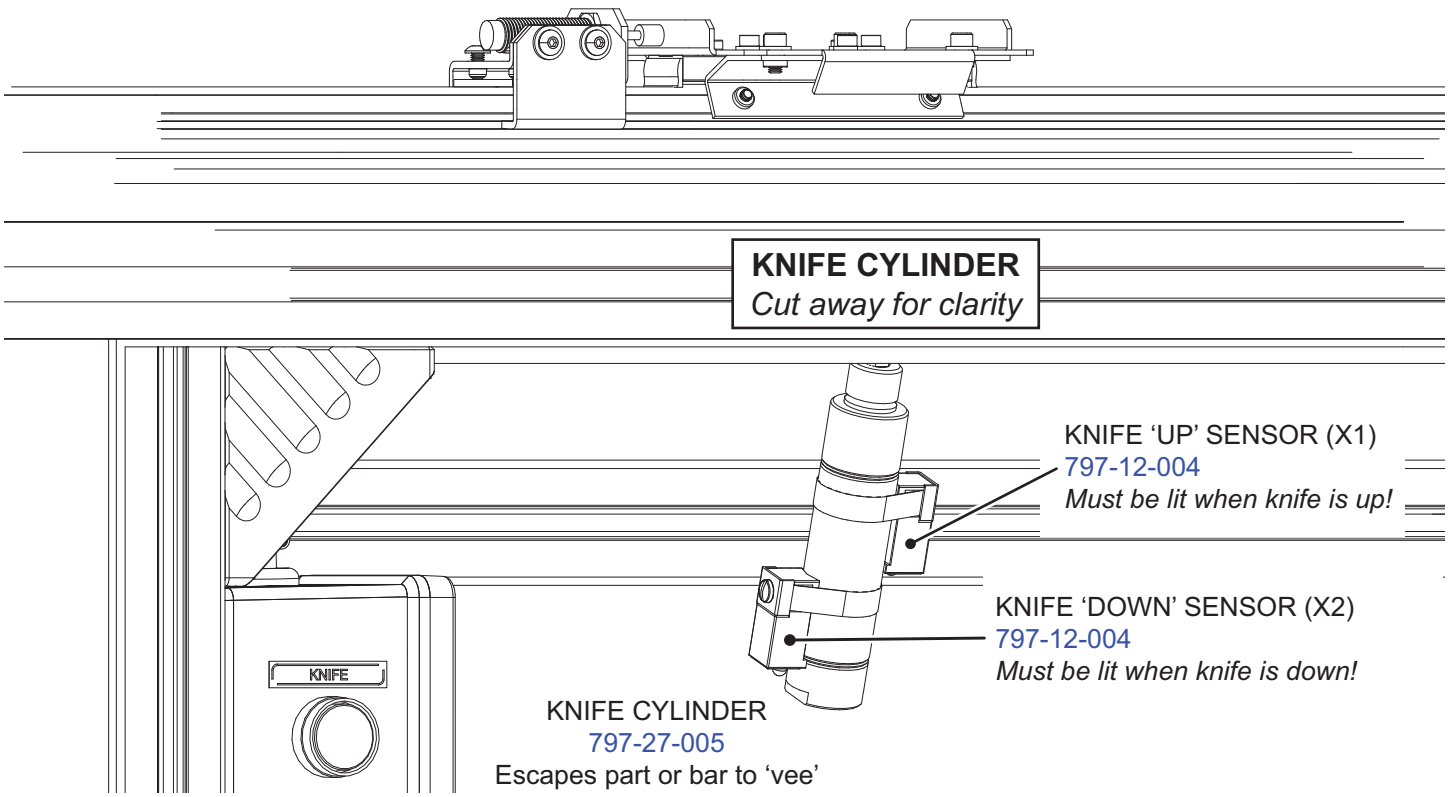


Shuttle Components

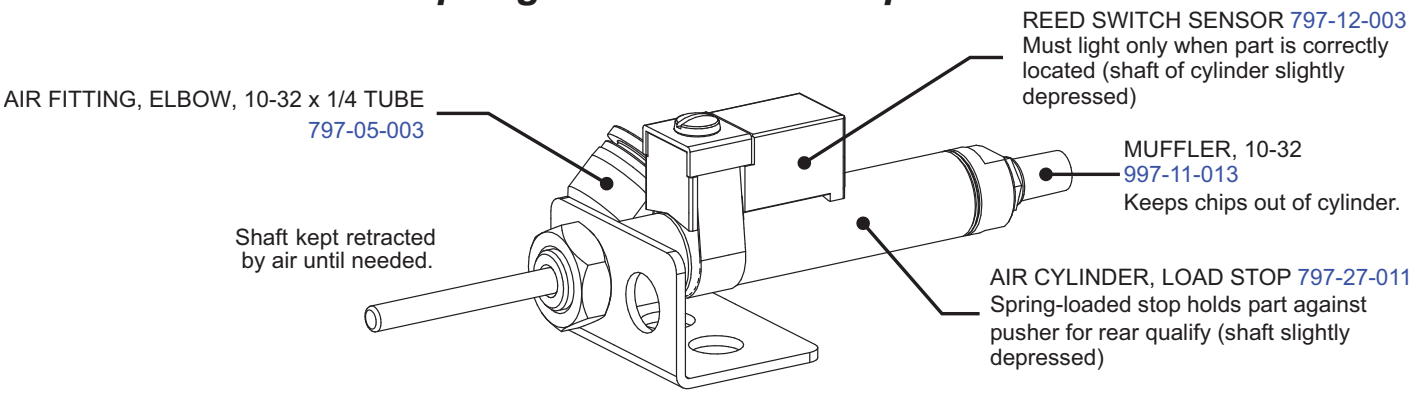
OmniTurn ZipLoader Shuttle Components
("RTC Rodless: after March 2015)



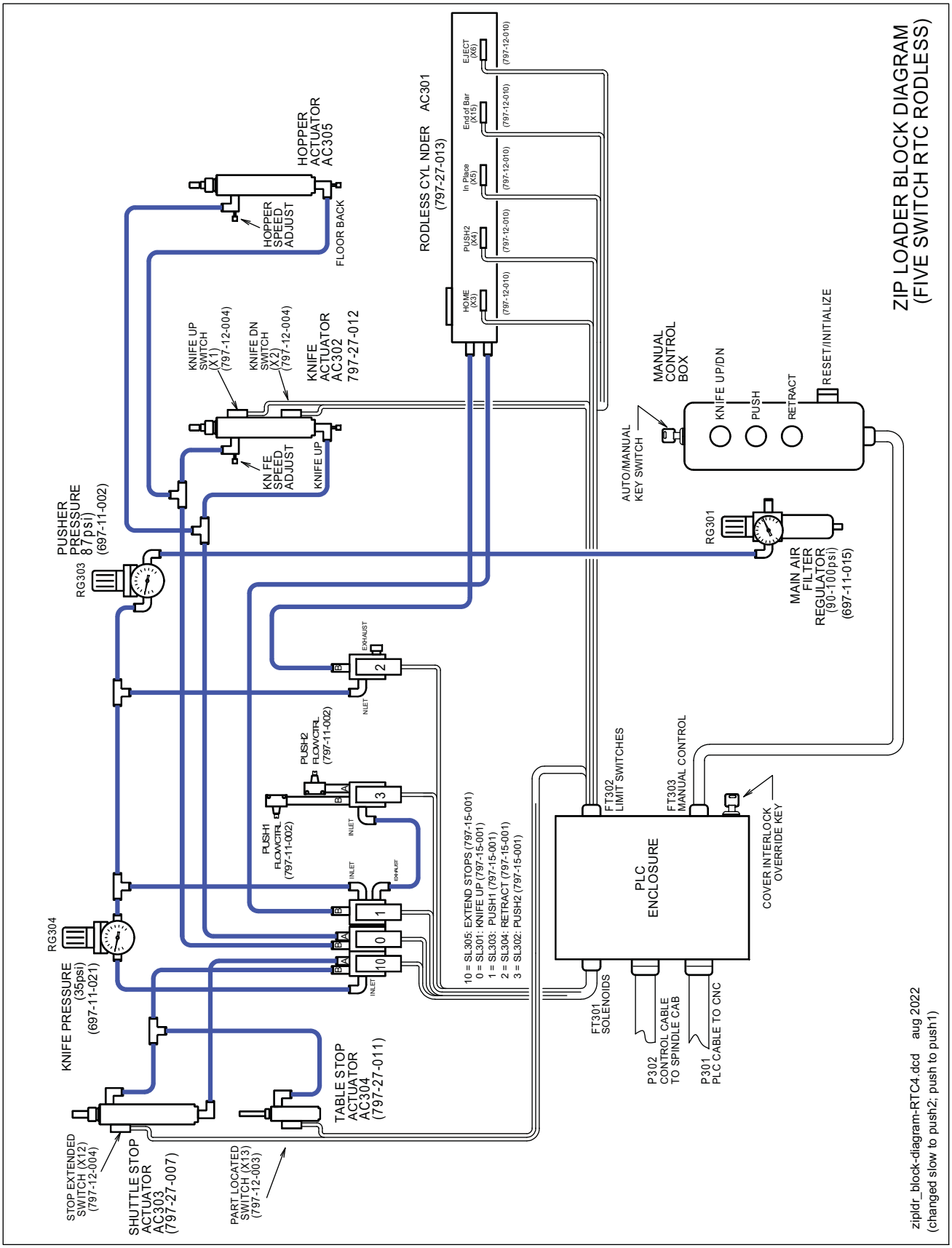
Knife Cylinder and Spring-loaded Stop Parts List

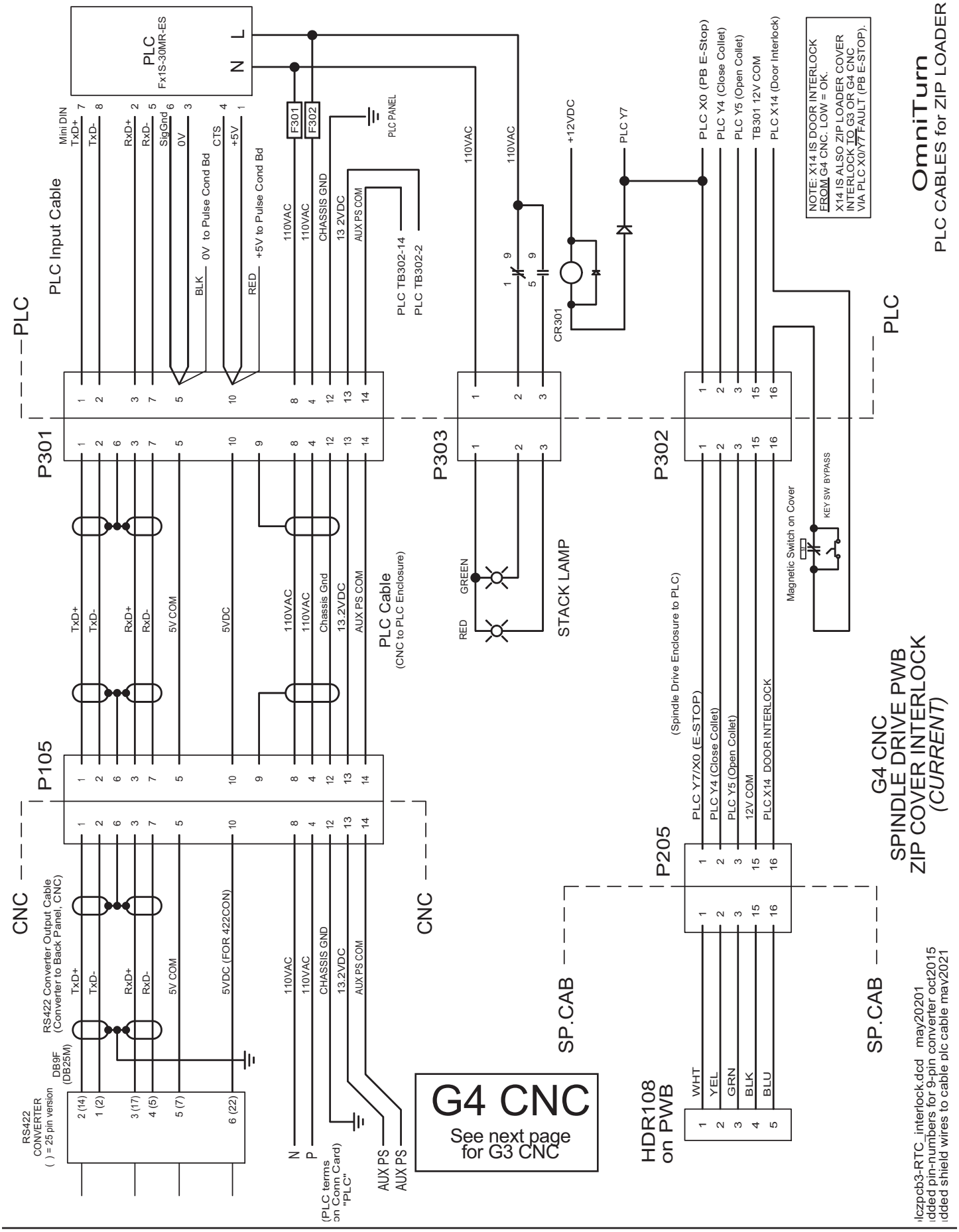


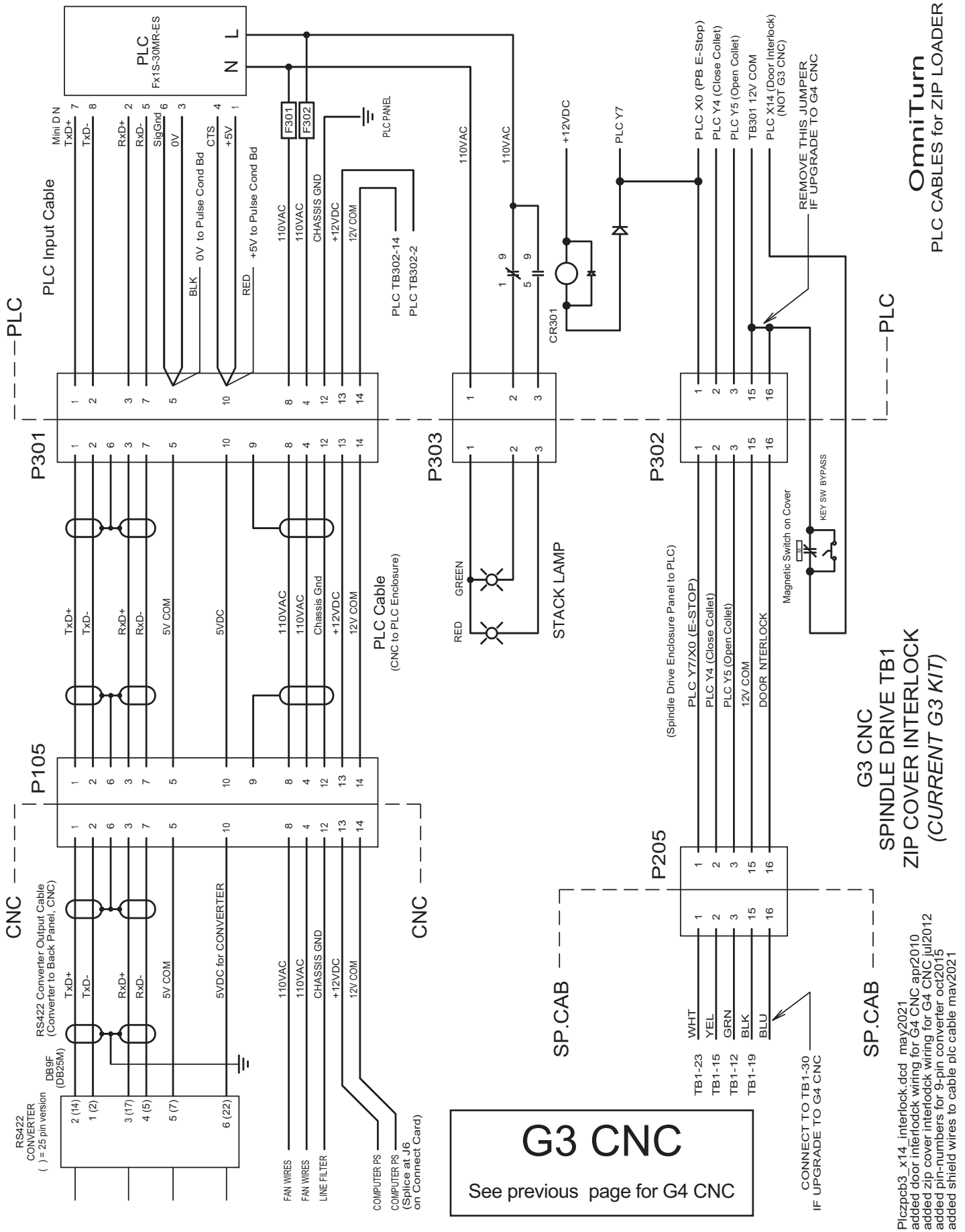
Spring-loaded Table Stop

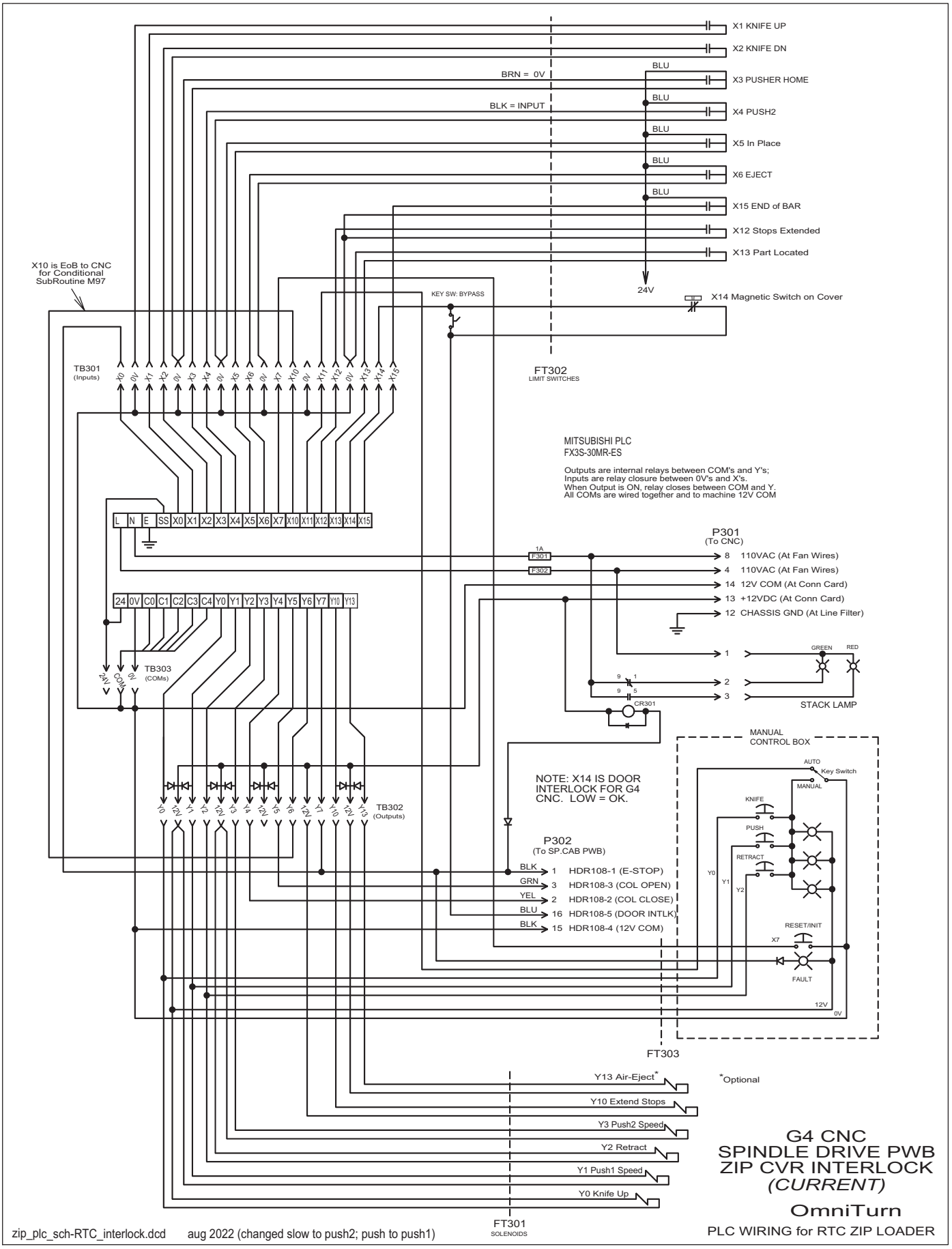


This assembly is stored in the PLC cabinet. Use it with Rear Stop to qualify parts to overall length. See "Operation & Programming" document for more information.

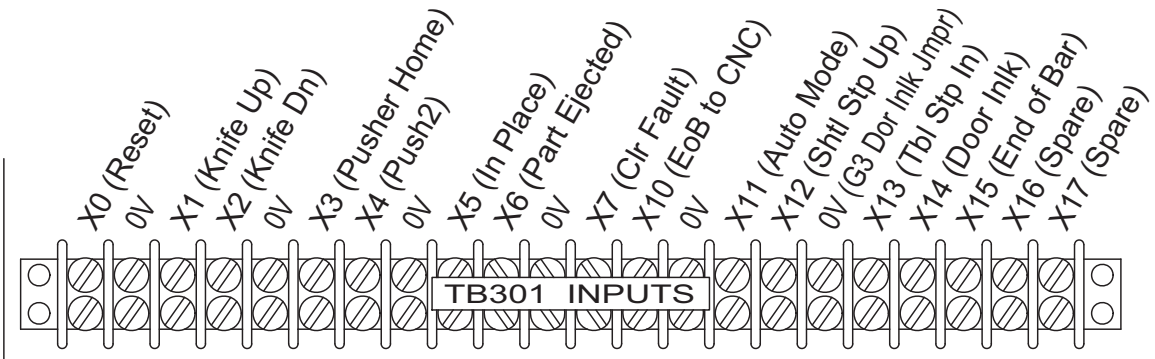

ZIP LOADER BLOCK DIAGRAM
(FIVE SWITCH RTC RODLESS)
RODLESS CYL NDER AC301
(797-27-013)
HOME (X3) (797-12-010)
PUSH2 (X4) (797-12-010)
In Place (X5) (797-12-010)
End of Bar (X15) (797-12-010)
EJECT (X6) (797-12-010)
HOPPER ACTUATOR AC305
HOPPER SPEED ADJUST
FLOOR BACK
KNIFE ACTUATOR AC302 797-27-012
KNIFE UP SWITCH (X1) (797-12-004)
KNIFE DN SWITCH (X2) (797-12-004)
KN FE SPEED ADJUST
KNIFE UP
MANUAL CONTROL BOX
KNIFE UP/DN
PUSH
RETRACT
RESET/INITIALIZE
AUTO/MANUAL KEY SWITCH
RG301
MAIN AIR FILTER REGULATOR (90-100psi) (697-11-015)
PUSHER PRESSURE 87psi (697-11-002)
RG303
PUSH2 FLOWCTRL (797-11-002)
PUSH1 FLOWCTRL (797-11-002)
EXHAUST
INLET
10 = SL305: EXTEND STOPS (797-15-001)
0 = SL301: KNIFE UP (797-15-001)
1 = SL303: PUSH1 (797-15-001)
2 = SL304: RETRACT (797-15-001)
3 = SL302: PUSH2 (797-15-001)
FT302 LIMIT SWITCHES
FT303 MANUAL CONTROL
PLC ENCLOSURE
COVER INTERLOCK OVERRIDE KEY
RG304
KNIFE PRESSURE (35psi) (697-11-021)
FT301 SOLENOIDS
P302 CONTROL CABLE TO SPINDLE CAB
P301 PLC CABLE TO CNC
TABLE STOP ACTUATOR AC304 (797-27-011)
STOP EXTENDED SWITCH (X12) (797-12-004)
SHUTTLE STOP ACTUATOR AC303 (797-27-007)
PART LOCATED SWITCH (X13) (797-12-003)
zipldr_block-diagram-RTC4.dcd aug 2022
(changed slow to push2; push to push1)


G4 CNC
See next page for G3 CNC
OmniTurn
PLC CABLES for ZIP LOADER
G4 CNC
SPINDLE DRIVE PWB
ZIP COVER INTERLOCK
(CURRENT)
PLC
CNC
SP.CAB
P105
P301
P303
P302
P205
PLC Input Cable
PLC Cable
(CNC to PLC Enclosure)
RS422 Converter Output Cable
(Converter to Back Panel, CNC)
RS422 CONVERTER
( ) = 25 pin version
DB9F
(DB25M)
HDR108
on PWB
STACK LAMP
KEY SW BYPASS
Magnetic Switch on Cover
(Spindle Drive Enclosure to PLC)
NOTE: X14 IS DOOR INTERLOCK FROM G4 CNC. LOW = OK.
X14 IS ALSO ZIP LOADER COVER INTERLOCK TO G3 OR G4 CNC VIA PLC X0/Y7 FAULT (PB E-STOP).


PLC
PLC Input Cable
Mini D N
TxD+
TxD-
RxD+
RxD-
SigGnd
0V
CTS
+5V
0V to Pulse Cond Bd
+5V to Pulse Cond Bd
BLK
RED
PLC
FX1S-30MR-ES
N L
F301
F302
PLC PANEL
110VAC
CHASSIS GND
+12VDC
12V COM
PLC TB302-14
PLC TB302-2
CR301
PLC Y7
PLC X0 (PB E-Stop)
PLC Y4 (Close Collet)
PLC Y5 (Open Collet)
TB301 12V COM
PLC X14 (Door Interlock)
(NOT G3 CNC)
REMOVE THIS JUMPER
IF UPGRADE TO G4 CNC
OmniTurn
PLC CABLES for ZIP LOADER
P301
P303
P302
P105
P205
CNC
PLC
5V COM
5VDC
Chassis Gnd
PLC Cable
(CNC to PLC Enclosure)
RED
GREEN
STACK LAMP
(Spindle Drive Enclosure Panel to PLC)
PLC Y7/X0 (E-STOP)
DOOR NTERLOCK
Magnetic Switch on Cover
KEY SW BYPASS
G3 CNC
SPINDLE DRIVE TB1
ZIP COVER INTERLOCK
(CURRENT G3 KIT)
RS422 Converter Output Cable
(Converter to Back Panel, CNC)
DB9F
(DB25M)
RS422
CONVERTER
( ) = 25 pin version
5VDC for CONVERTER
FAN WIRES
LINE FILTER
COMPUTER PS
(Splice at J6
on Connect Card)
SP.CAB
WHT
YEL
GRN
BLK
BLU
TB1-23
TB1-15
TB1-12
TB1-19
CONNECT TO TB1-30
IF UPGRADE TO G4 CNC
G3 CNC
See previous page for G4 CNC
Plczpcb3_x14_interlock.dcd may2021
added door interlodck wiring for G4 CNC apr2010
added zip cover interlodck wiring for G4 CNC jul2012
added pin-numbers for 9-pin converter oct2015
added shield wires to cable plc cable may2021


X1 KNIFE UP
X2 KNIFE DN
BRN = 0V
BLU
X3 PUSHER HOME
BLK = INPUT
X4 PUSH2
X5 In Place
X6 EJECT
X15 END of BAR
X12 Stops Extended
X13 Part Located
24V
X14 Magnetic Switch on Cover
KEY SW: BYPASS
X10 is EoB to CNC for Conditional SubRoutine M97
TB301 (Inputs)
FT302 LIMIT SWITCHES
MITSUBISHI PLC
FX3S-30MR-ES
Outputs are internal relays between COM's and Y's;
Inputs are relay closure between 0V's and X's.
When Output is ON, relay closes between COM and Y.
All COMs are wired together and to machine 12V COM
P301
(To CNC)
8 110VAC (At Fan Wires)
4 110VAC (At Fan Wires)
14 12V COM (At Conn Card)
13 +12VDC (At Conn Card)
12 CHASSIS GND (At Line Filter)
F301
F302
TB303 (COMs)
GREEN
RED
STACK LAMP
CR301
MANUAL CONTROL BOX
AUTO
Key Switch
MANUAL
KNIFE
PUSH
RETRACT
RESET/INIT
FAULT
NOTE: X14 IS DOOR INTERLOCK FOR G4 CNC. LOW = OK.
TB302 (Outputs)
P302
(To SP.CAB PWB)
BLK 1 HDR108-1 (E-STOP)
GRN 3 HDR108-3 (COL OPEN)
YEL 2 HDR108-2 (COL CLOSE)
BLU 16 HDR108-5 (DOOR INTLK)
BLK 15 HDR108-4 (12V COM)
FT303
*Optional
Y13 Air-Eject*
Y10 Extend Stops
Y3 Push2 Speed
Y2 Retract
Y1 Push1 Speed
Y0 Knife Up
FT301 SOLENOIDS
G4 CNC
SPINDLE DRIVE PWB
ZIP CVR INTERLOCK
(CURRENT)
OmniTurn
PLC WIRING for RTC ZIP LOADER
zip_plc_sch-RTC_interlock.dcd aug 2022 (changed slow to push2; push to push1)

PLC Panel Label



Inputs:

X0 = E-Stop from CNC
X1 = Knife is Up
X2 = Knife is Down
X3 = Pusher at Home
X4 = Push2 Switch
X5 = In Place Switch
X6 = Eject Switch
X7 = Clear Fault PB
X10 = EoB to CNC (M97)
X11 = Auto Mode
X12 = Shuttle Stop Up
X13 = Table Stop Depressed
X14 = Door Interlock (NOT G3 CNC)
X15 = End of Bar
X16 = Spare
X17 = Spare

Outputs:

Y0 = Knife Up (Else down)
Y1 = Push
Y2 = Retract
Y3 = Low Pressure to Pusher
Y4 = Clamp Collet
Y5 = UnClamp Collet
Y6 = End of Bar (Wired to X10)
Y7 = Fault (E-Stop to CNC)
Y10 = Extend Stops
Y11 = Spare
Y12 = Spare
Y13 = Air Eject Option
Y14 = Spare
Y15 = Spare

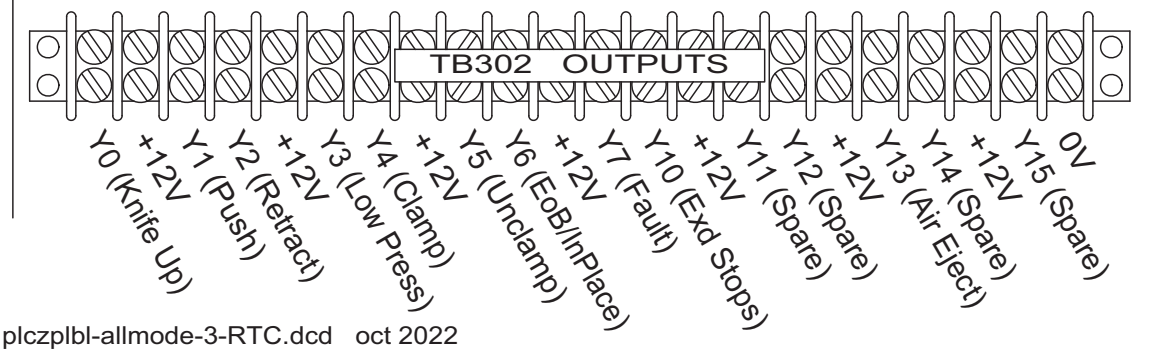
Programming:

M10 = Stop Feed Close Collet*
M11 = Open Collet Start Feed*
M40 = Knife Up
M41 = Knife Down
M42 = Push at Push2 speed
M43 = Retract (Edit to suit)
M44 = Stop Pusher
M45 = Extend Stops
M46 = Retract Stops
M47 = Load New Bar or Part
M48 = Eject
M49 = Push Fast (hard)
M50 = Set Bar Mode
M51 = Set Part Mode
M52 = Set Stop Mode
M53 = 2Part Mode
M54 = 2Part Mode, slow switch
M56 = Force Loader Fault
M57 = No Push2 Speed Change
M59 = Push2 Eject

*2part M10 = Close Collet and escape next part to vee.

*2part M11 = Open Collet eject finished part, present next part.

FUSES: 3AG 1A
POWER: 110VAC from CNC



plczplbl-allmode-3-RTC.dcd oct 2022