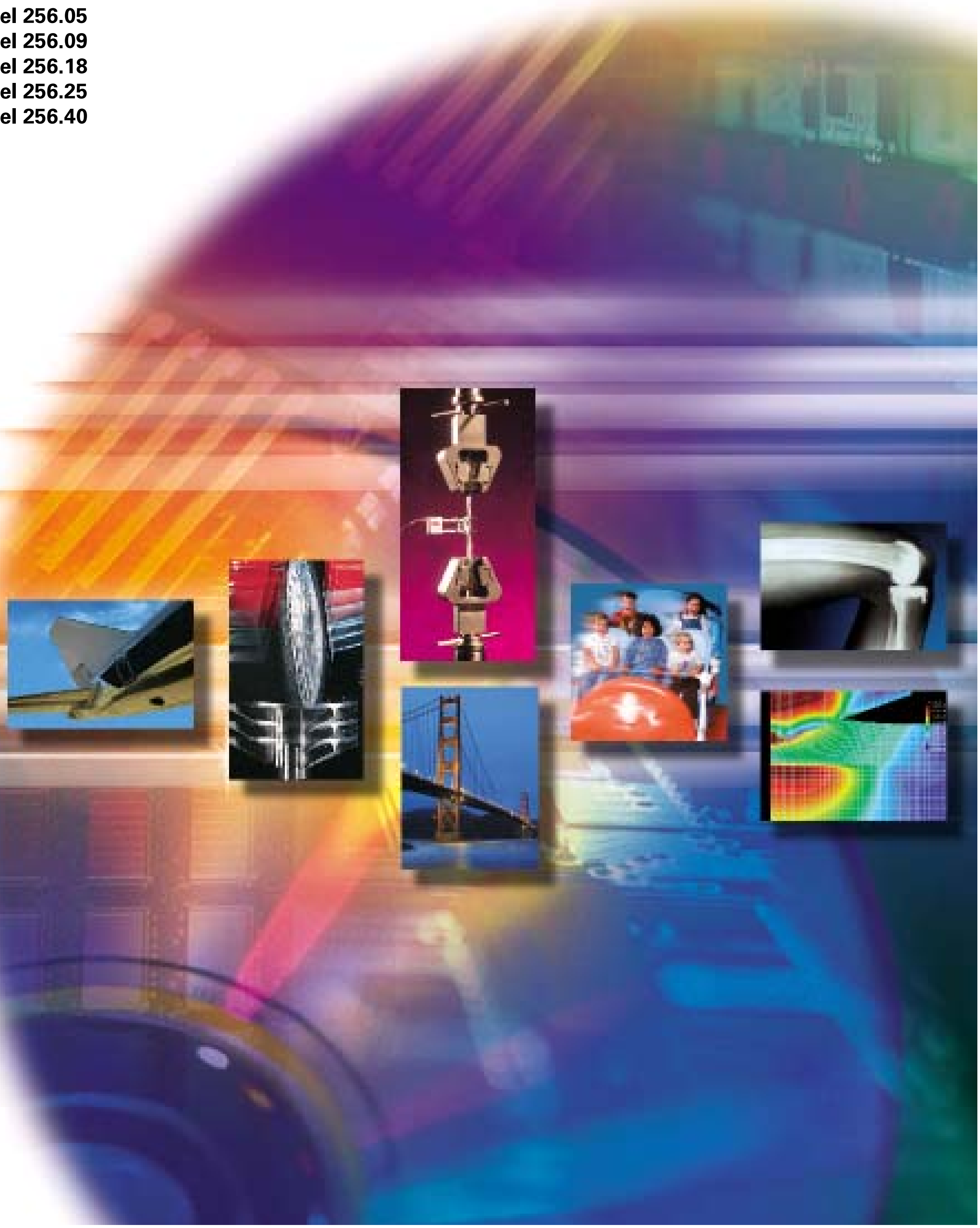
Series 256 Servovalve Product Information

Model 256.04
Model 256.05
Model 256.09
Model 256.18
Model 256.25
Model 256.40



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ISO 9001 Certified

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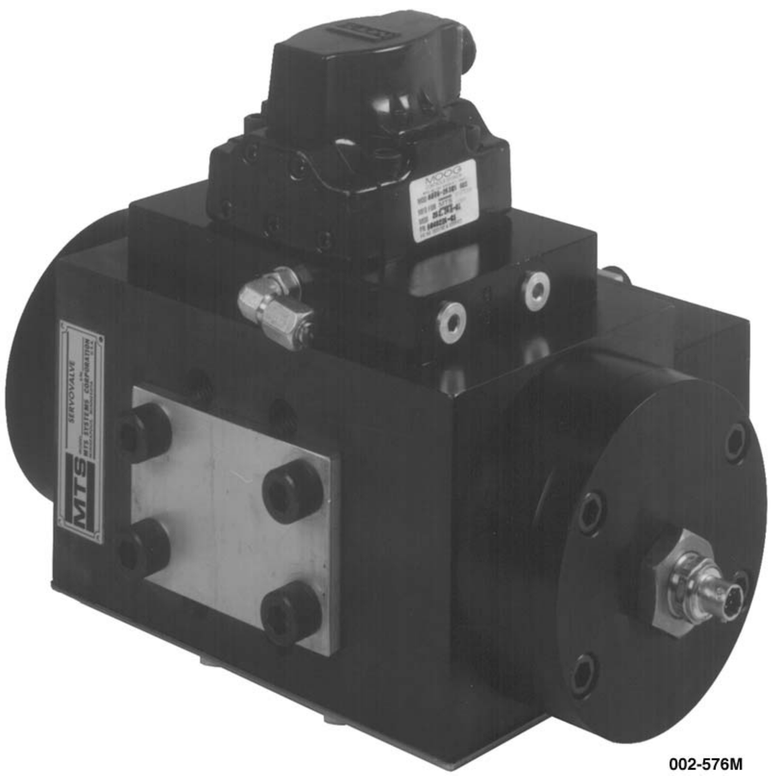
Contents

Introduction

The MTS Series 256 Servovalves regulate the rate and direction of hydraulic fluid flow to and from hydraulic actuators requiring from 113 to 1500 L/min (30 to 400 gpm) of fluid flow.

Contents



002-576M

Series 256 Servovalve

What you need to know

MTS Systems Corporation assumes that you know how to use your controller. See the appropriate manual for information about performing any controller-related step in this manual's procedures. You are expected to know how to perform the following procedures.

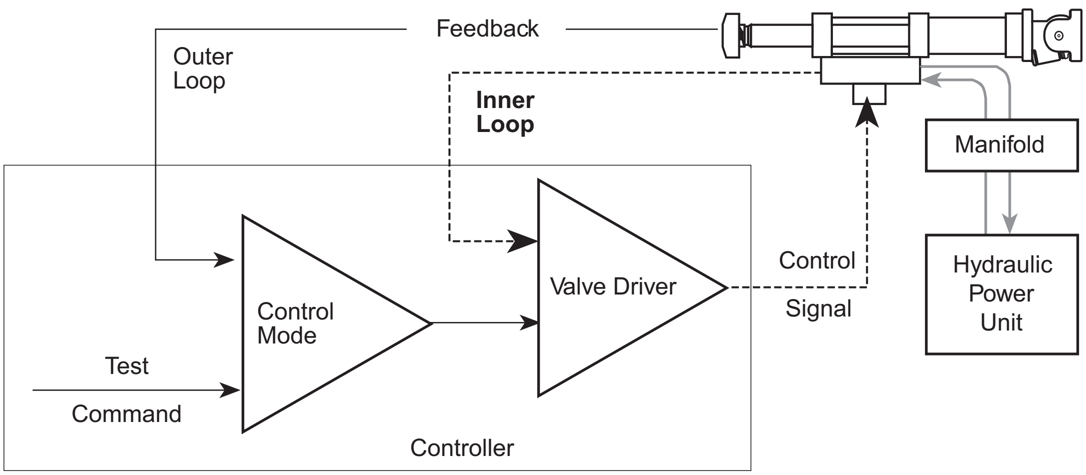
- Turning hydraulic pressure on and off
- Selecting a control mode
- Manually adjusting the actuator position
- You should have experience installing or servicing servohydraulic equipment.

Related products

The Series 256 Servovalves includes a Series 252 Servovalve. See the *Series 252 Servovalve Product Information* manual (part number 011-182-906) for product-specific information and maintenance procedures for the Series 252 Servovalve.

Functional Description

The heart of a servohydraulic system is the servovalve. It is the final control element in most MTS closed-loop systems. The servovalve responds to command signals generated by the software and processed by the controller and output through the valve driver module. The servovalve regulates the direction and flow of the hydraulic fluid entering the actuator from the hydraulic pressure ports. The direction that the spools move determines the direction of fluid flow to the actuator. A pressure difference is what causes the fluid to move.



Typical Closed-Loop System

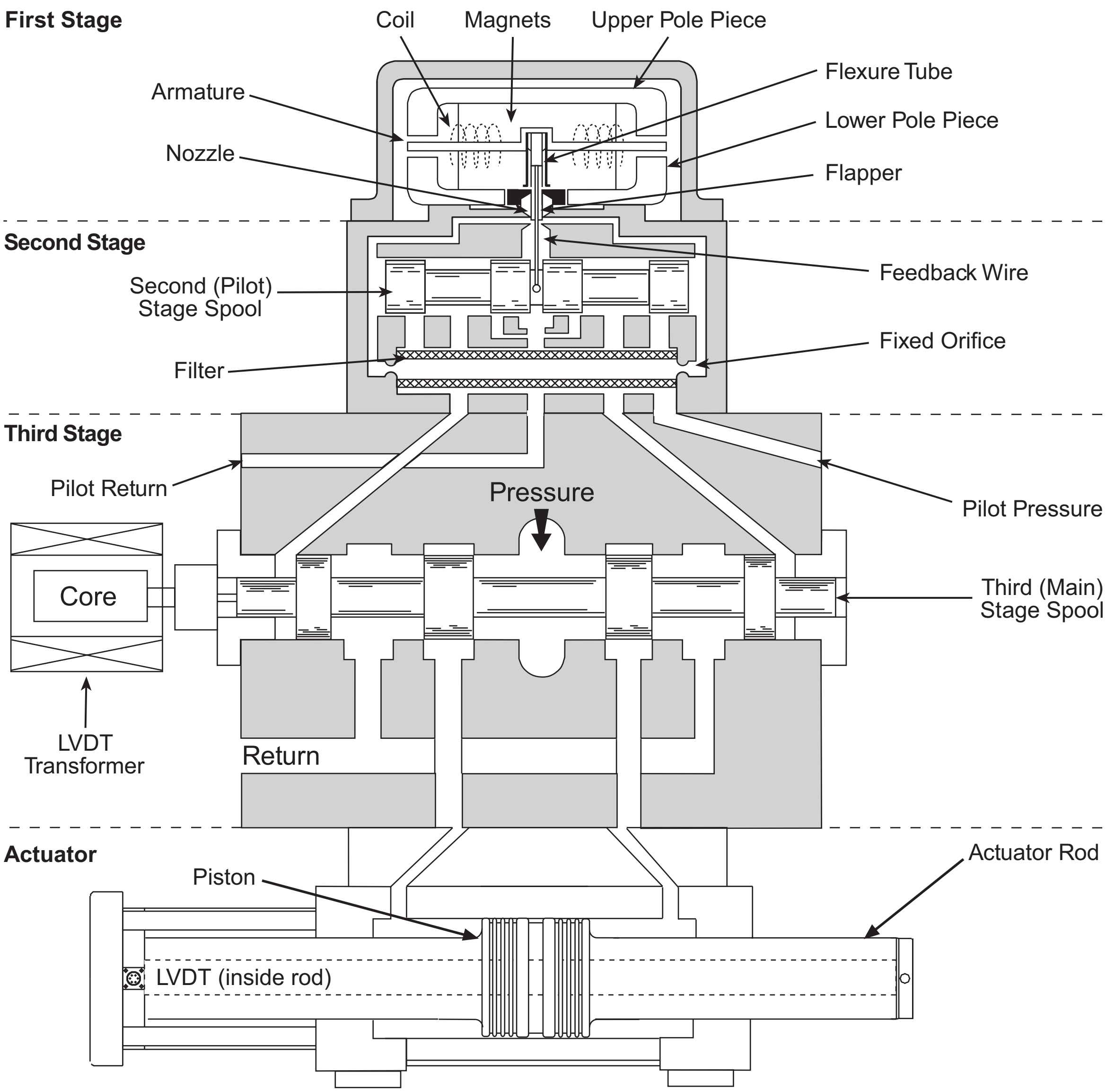
Control signal

In a closed-loop hydraulic system, the Product Name uses the control signal from an electronic control device (controller) to operate a valve that regulates the movement of a hydraulic actuator.

The control signal is created by comparing the program command signal (the desired actuator position) and the feedback signal from a transducer (the actual actuator position). Any difference between the two is called DC error, which is the command to the servovalve to supply hydraulic fluid to the actuator until the desired actuator position is achieved.

Multiple stages

The Series 256 Servovalve contains three stages. The first and second stages are formed by a Series 252 Servovalve. The first stage is a torque motor armature that controls a flapper valve in the second stage. This valve in turn controls the flow of hydraulic fluid (and therefore the movement of the spool) in the second stage. The position of the spool in the second stage, in turn, controls the flow of hydraulic fluid to the third stage. The third stage of the Series 256 Servovalve is the main stage, which contains a larger four-way spool. The position of the third stage spool is measured by a linear variable differential transformer (LVDT).



Functional Diagram

Servovalve at rest

The servovalve's controlling element is the torque motor, which receives an electrical input from the controller. A flapper is attached to the armature of the torque motor. The flapper moves from side to side as the armature moves in response to control signals from the controller. The flapper assembly is mechanically attached to the armature. There are two nozzles, one on each side of the flapper.

Because the nozzle-flapper valve is the first control point of hydraulic fluid, it is called the first stage. As long as there is no command for actuator motion, the flapper is centered between the two nozzles.

At the same time, pressurized hydraulic fluid entering the valve is applied equally to both sides of the spool, which does not move. This is the second stage.

Moving the spool

A command from the controller causes the armature to rotate clockwise or counterclockwise (depending on the polarity of the command). The command causes the flapper to block one of the nozzles which diverts hydraulic flow to that end of the spool. The spool moves and opens hydraulic pressure to one control port and the return line to the other control port. The control ports are connected to each end of the actuator.

Stopping the spool

The feedback wire works like a spring. The spool moves until the feedback wire torque equals the torque from the magnetic forces. This causes the flapper to move back toward the centered position. The spool stops at a position where the feedback wire spring torque equals the torque input current of the command. The spool position is proportional to the input command current.

Although the pressures are equal on both sides of the spool (so the spool is no longer moving), control flow from the servovalve keeps the actuator moving.

Stopping actuator movement

When the actuator has moved the desired amount, the valve drive command decreases to zero. Hydraulic fluid flow to the actuator stops, and so does the actuator.

Specifications

The following subsections list the general specifications, performance specifications and performance characteristics of the Series 256 Servovalve

General specifications

The following table shows the specifications that are common to all Series 256 Servovalves.

Parameter	Specification
Temperature range	-54°C to +135°C (-65°F to +275°F)
Operating pressure*	The normal operating pressure is 21 MPa (3000 psi)
Maximum	21 MPa (3000 psi)
Minimum	1.3 MPa (100 psi)
Recommended hydraulic fluid‡	Mobil DTE 25 or Shell Tellus 46
Pilot stage filtration	3 microns absolute
Main stage filtration	12 microns absolute
Seals	Buna-N Standard†
LVDT	.
Excitation	20 V p-p at 10 kHz
Impedance	200 ¾ minimum at 10 kHz
Sensitivity	0.21 V/V per 0.100 inch (2.54 mm) stroke
Pilot stage full flow current	25 mA (series) 50 mA (differential) 50 mA (parallel)
Weight	
256.04-01 **256.05-01/02** **256.09-01/02** **256.18-01/02/05** **256.25-01/02/05** **256.40-01/02/05/10**	6.3 kg (14 lb) 7.3 kg (16 lb) 7.3 kg (16 lb) 9.3 kg (12 lb) 20.4 kg (43 lb) 45.4 kg (100 lb)

* Higher operating supply pressures up to 6000 psi (41 MPa) are available on request (contact MTS for information.

† Special seals are available on request on some 256 Models (contact MTS for information.

‡ For information on hydraulic fluid and hydraulic system care, see the *Hydraulic Fluid Care Guide* (MTS part number 050-000-536).

Performance Specifications

Static performance

Values are typical for Series 256 Servovalves operated at the recommended hydraulic fluid filtration levels (see "General specifications" on page 10).

Model*	Rated Flow		Nominal Gain		Pressure Gain	Pressure Coefficient		Null Flow	
	L/min	gpm	L/min/ % stroke	gpm % stroke	(% supply/ % stroke)	cm^3/ kgf-sec	in^3/sec/psi)	L/min	gpm
256.04	150	40	2.2	0.58	100	0.30	1.3x10-3	9.5	2.5
256.09	340	90	6.0	1.6	150	0.56	2.4x10-3	13.0	3.5
256.18	680	180	10.6	2.8	200	0.73	3.1x10-3	21.0	5.5
256.25	950	250	16.0	4.2	160	1.38	5.9x10-3	23.8	6.3
256.40	1500	400	29.0	7.7	250	1.38	6.9x10-3	20.4	7.5

Dynamic performance

The dynamic data is derived from typical Model 256 Servovalve driven with a valve controller with "rate" compensation. A constant amplitude sine wave was used as the input signal to the valve controller. The amplitude was plus-or-minus the main stage, full-stroke, LVDT voltage.

Model*	Rated Flow		Pilot Flow		Full Flow Frequency	90° Phase Signal†	Spool Stroke Rise Time (T_R) (milliseconds)	
	L/min	GPM	L/min	GPM	Hz	Hz	90% Open	10% Open
256.04A-01	150	40	3.8	1	80	130	4.8	3
256.09A-01	340	90	3.8	1	30	120	9	3.5
256.09A-02	340	90	9.5	2.5	80	130	4.6	4.3
256.18C-01	680	180	3.8	1	20	90	12	3
256.18C-02	680	180	9.5	2.5	30	100	7	2.2
256.18C-05	680	180	19	5	50	100	5.5	1.8
256.25A-01	950	250	3.8	1	10	90	15	10
256.25A-02	950	250	9.5	2.5	18	125	<10	<10
256.25A-05	950	250	19	5	25	125	8	4
256.40A-01	1500	400	3.8	1	4‡	40‡	65‡	20‡
256.40A-02	1500	400	9.5	2.5	9‡	75‡	26‡	8‡
256.40A-05	1500	400	19	5	12‡	110	13	4
256.40A-10	1500	400	3.8	10	15‡	110	10	3.5

* Performance information is provided for the models listed. Contact MTS for performance information for Models 256.18D and 256.XXB.

† At 10% spool stroke.

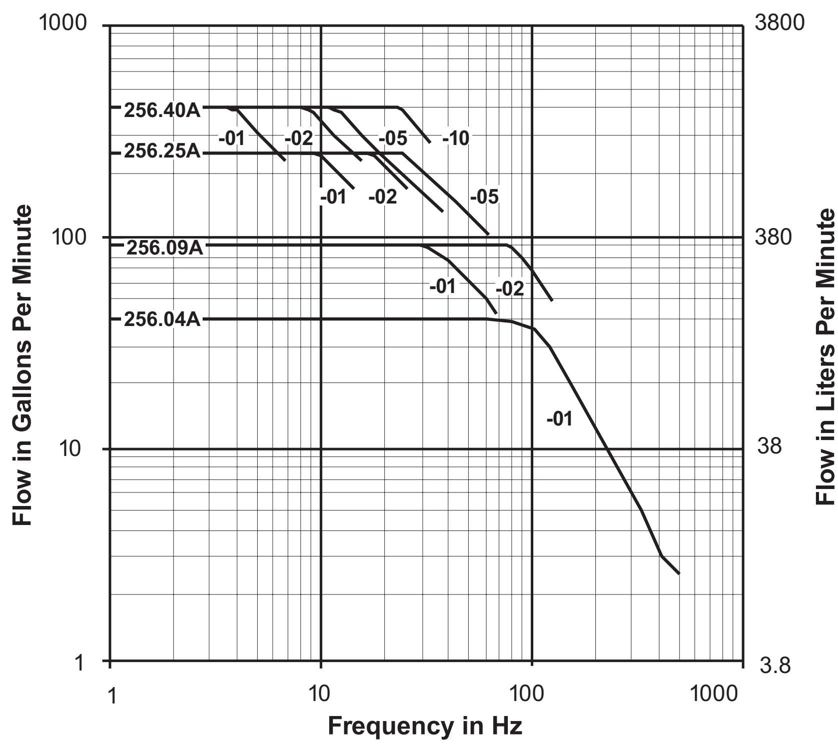
‡ These are estimated values. All other values are typical.

Performance Characteristics

Note *The servovalve flow at the higher frequencies depends on many system characteristics that are unrelated to the Model 256 Servovalve (such as, hydraulic fluid compressibility, supply and return line lengths, actuator characteristics and specimen characteristics).*

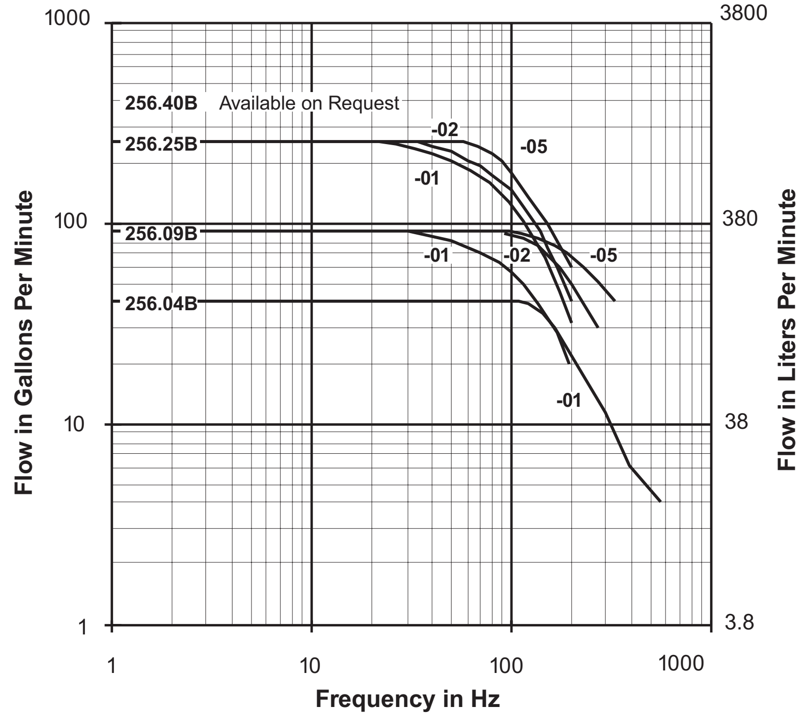
The flow vs. frequency performance curves shown in following figures indicate the relative performance of the 256 servovalves at various frequencies. The curves are derived by driving the servovalve at the indicated frequency with a sine wave control signal and ± full current to the coil. A 21 MPa (3000 psi) pressure is supplied and there is a 7 MPa (1000 psi) pressure drop across the servovalve.

Servovalve performance at higher frequencies is a function of variables introduced by system components, actuator response, and specimen characteristics.

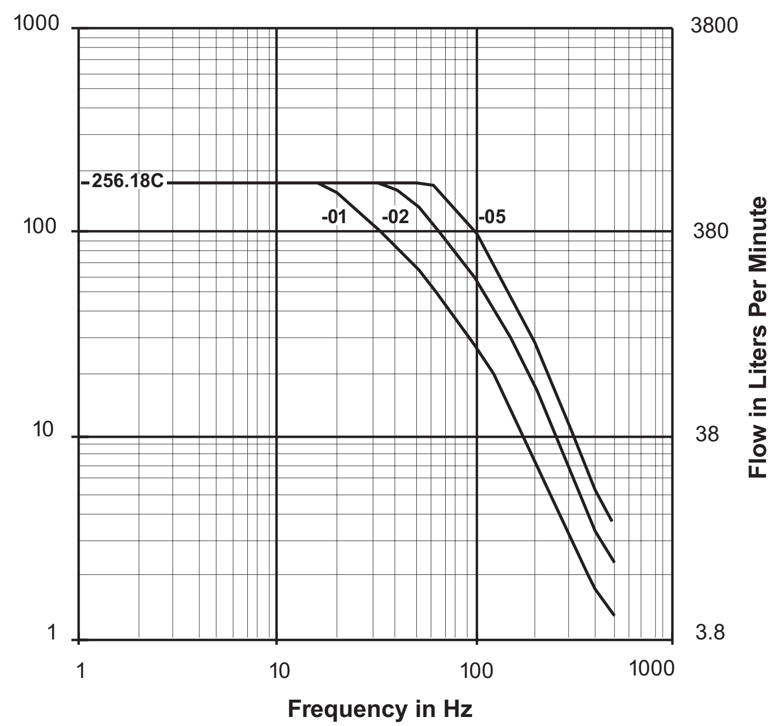


Series 256.XXA Flow vs. Frequency Servovalve Performance Curves

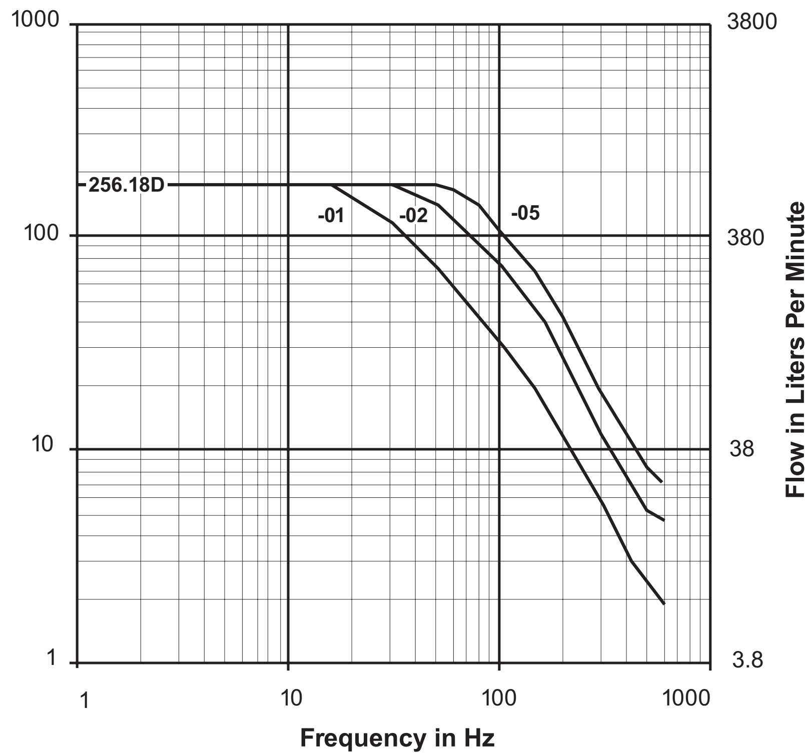
Note *Performance is with 21 MPa (3000 psi) pressure supplied and 7 MPa (1000 psi) pressure drop across the servovalve.*



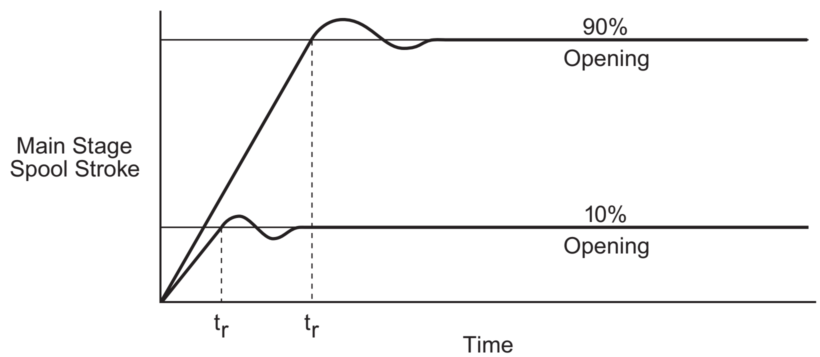
Series 256.XXB Flow vs. Frequency Performance Curves



Series 256.18C Flow vs. Frequency Performance Curves



Series 256.18D Flow vs. Frequency Performance Curves



Series 256 Servovalve - Rise Time

Installation

This section describes how to install a Series 256 Servovalve. This procedure assumes that all electrical and hydraulic power to the system is off, and that the residual hydraulic pressure in the system is at zero.

Contents

CAUTION

Mixing different brands of hydraulic fluid can contaminate your system.

Contaminated hydraulic fluid can cause premature wear of the hydraulic components in your system.

Do not mix different brands of hydraulic fluid. MTS Systems Corporation recommends using Mobil DTE-25 or Shell Tellus 46 AW hydraulic fluid.

WARNING

An active system has electrical or hydraulic power turned on.

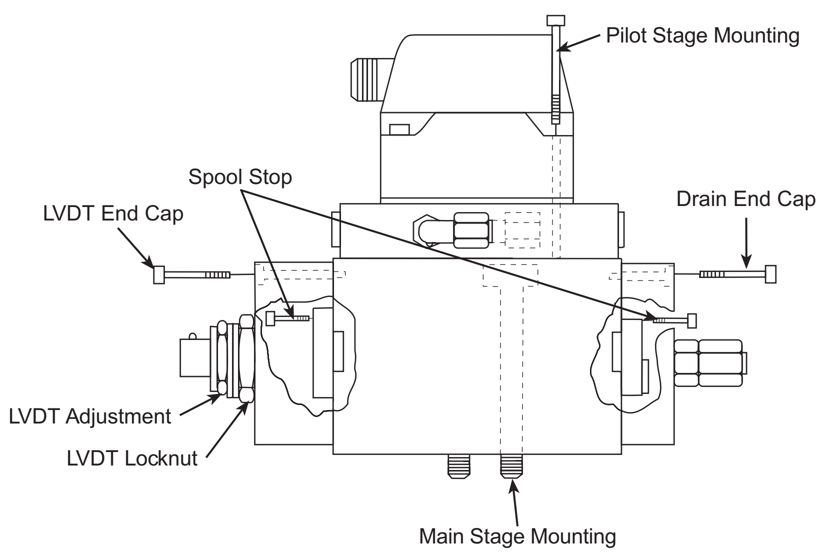
Disturbing components of an active system can cause unexpected actuator motion and result in injury to personnel and/or damage to equipment.

Before installing or replacing a servovalve, ensure that all electrical and hydraulic power to the system is off, and residual hydraulic pressure in the system is at zero.

Mounting the Main Stage

Perform the following procedure to mount the main stage and manifold to an actuator.

1. Remove any cover plates from the main stage and actuator manifold ports.
2. Ensure that all O-rings are in good condition.
3. Lubricate all O-rings with a light film of hydraulic fluid and place in their proper positions.
4. Mount the main stage body onto the actuator manifold and align the mounting holes.
5. Lubricate the main stage mounting screws with a light film of hydraulic fluid and tighten the mounting screws to:
   - For Models 256.04/.09/.18 tighten the screws to 47.45 N·m (35 lbf·ft)
   - For Models 256.25/.40 tighten the screws to 146 N·m (108 lbf·ft).
6. As you tighten the screws, those previously tightened will lose clamping force. Continue tightening until all screws are at the specified torque.
7. Mount the main stage manifold onto the main stage body and line up the mounting holes.
8. Go to "Mounting the Pilot Stage" on page 17 to continue the installation procedure.



Mounting Screw Locations

Mounting the Pilot Stage

Perform the following procedure to mount the pilot stage (a Series 252 Servovalve) to a main stage manifold.

1. Ensure that system hydraulic pressure has been reduced to zero before proceeding. To do this, turn off the hydraulic power unit and exercise the actuator until it stops moving.
2. Remove the cover plate or existing pilot stage from the manifold.
3. Ensure that the O-rings between the pilot stage and main stage manifold are lubricated with a light film of hydraulic fluid and are correctly positioned.

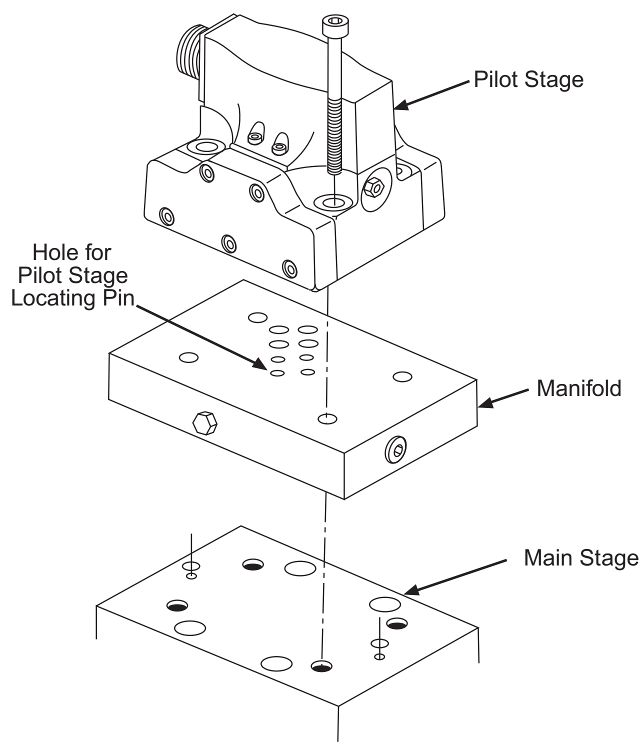
⚠ WARNING

The alignment pin ensures the servovalve assembly is properly positioned over the hydraulic ports.

Failure to correctly align the locating pin and locating hole can result in injury to personnel and/or damage to equipment.

Ensure that the locating pin on the bottom of the servovalve is correctly positioned within the locating hole of the actuator, manifold, or secondary servovalve.

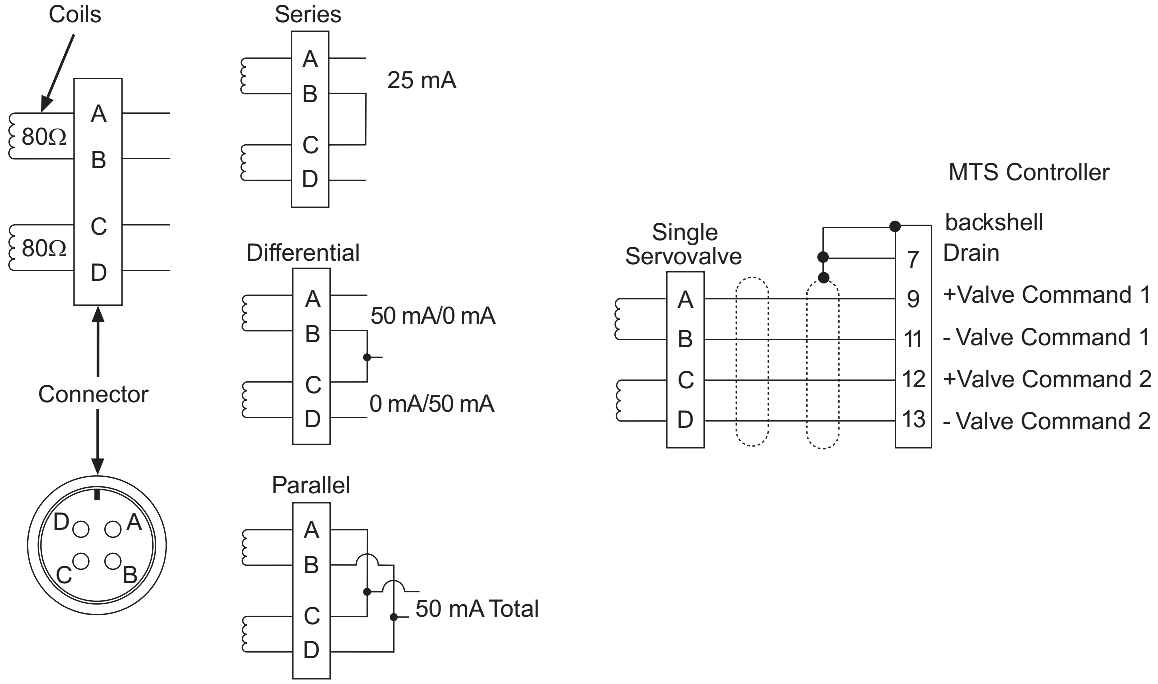
4. Install the pilot stage onto the manifold, aligning the locating pin (as shown in the following figure).



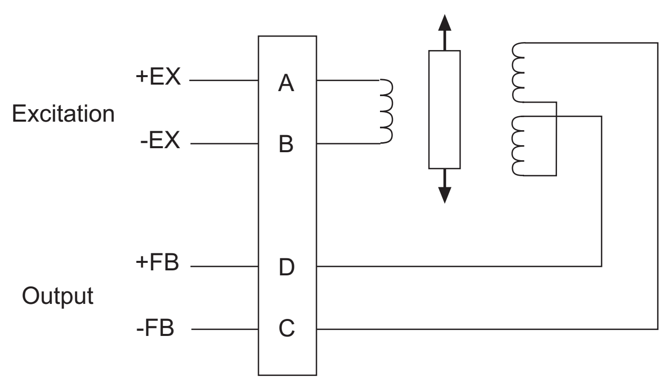
5. Lubricate the mounting screws with a light film of hydraulic fluid. Tighten the mounting screws to 24.40 N·m (18 lbf·ft). As you tighten the screws, those previously tightened will lose clamping force. Continue tightening until all screws are at the specified torque.
6. Connect all hydraulic supply and return lines.
7. Connect control cables between the servovalve and the system controller. This includes a valve drive cable to the pilot stage and a inner loop feedback cable to the LVDT in the third stage.
8. Turn on system electrical power and hydraulic power.
9. Apply low hydraulic pressure to the servovalve so that the hydraulic fluid will fill the filter cavities gradually.
10. Apply high pressure and check for leaks at the servovalve hydraulic connections and at the base of the servovalve.

Connecting the Cables

The following figures show the pilot stage internal coils and connector wiring and the three cable wiring variations that can be used. The main stage LVDT internal coils and connector wiring.



Pilot Stage Coils and Connector



Note *C and D leads may be reversed for proper phasing.*

LVDT Coils and Connector

Service

This section describes service procedures that can be performed on the Series 256 Servovalve by field service engineers. If additional service is required, call your local MTS Systems Corporation service representative.

Important ***This section describes service procedures that should be performed by a person who has experience servicing servohydraulic equipment. The procedures in this section require the load unit to be disassembled beyond what is needed for operation or maintenance.***

We assume you are familiar with all operating aspects of your system controller (electronic and software controls) and you are familiar with the hardware components of your system.

Contents

CAUTION

Mixing different brands of hydraulic fluid can contaminate your system.

Contaminated hydraulic fluid can cause premature wear of the hydraulic components in your system.

Do not mix different brands of hydraulic fluid. MTS Systems Corporation recommends using Mobil DTE-25 or Shell Tellus 46 AW hydraulic fluid.

WARNING

An active system has electrical or hydraulic power turned on.

Disturbing components of an active system can cause unexpected actuator motion and result in injury to personnel and/or damage to equipment.

Before installing or replacing a servovalve, ensure that all electrical and hydraulic power to the system is off, and residual hydraulic pressure in the system is at zero.

Removing the Servovalve

This section describes how to remove the pilot valve from the main stage of the servovalve. And how to remove the main stage from its mounting.

⚠ CAUTION

Uncovered hydraulic ports are a source of contamination.

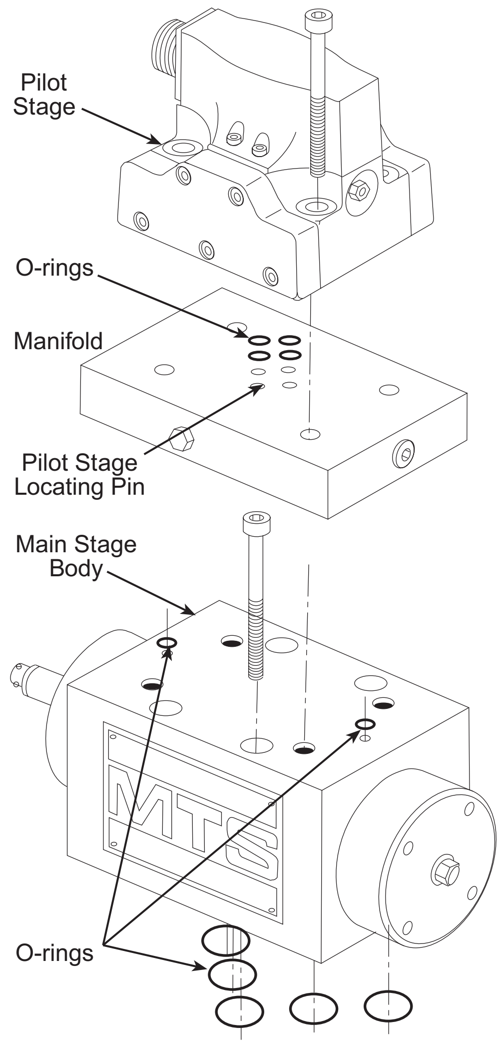
Failure to cover the servovalve ports, and actuator, manifold, or secondary servovalve ports with protective cover plates can allow contaminants to enter and damage the system.

After removing the servovalve, cover the ports of the servovalve, actuator, manifold with protective plates as soon as possible.

Removing the pilot stage

Perform the following procedure to remove the pilot stage from the main stage.

1. Ensure that system hydraulic pressure has been reduced to zero before proceeding. To do this, turn off the hydraulic power unit and exercise the actuator until it stops moving.
2. Disconnect the electrical cable from the pilot stage.
3. Remove the mounting screws used to secure the pilot stage to the manifold and main stage.
4. While removing the pilot stage, retain the o-rings located between the ports of the pilot stage and the manifold.
5. Immediately cover the pilot stage and the manifold ports with protective cover plates.



Servovalve Mounting

Removing the main stage

To remove the main stage from the system, perform the following procedure after the removal of the pilot stage. Refer to the figure "Servovalve Mounting" on page 22 during the following procedure.

1. Disconnect the LVDT control cable.
2. Disconnect all hydraulic lines from the manifold and main stage.
3. Lift the manifold from the main stage. Set the O-ring seals in a clean area.
4. Remove the four mounting screws from the main stage body and lift the main stage body from the actuator manifold. Set the O-ring seals aside in a clean area.
5. Immediately cover the open ports on the main stage body and the actuator manifold with protective cover plates.

Disassembling the Main Stage

Note *Except for O-ring replacement, field repair of the main stage is generally not practical, contact MTS Systems Corporation if repair is necessary.*

The servovalve is susceptible to damage from contaminated hydraulic fluid. If it becomes necessary to remove the servovalve, ensure all open ports are properly covered to avoid contamination.

⚠ CAUTION

Uncovered hydraulic ports are a source of contamination.

Failure to cover the servovalve ports, and actuator, manifold, or secondary servovalve ports with protective cover plates can allow contaminants to enter and damage the system.

After removing the servovalve, cover the ports of the servovalve, actuator, manifold with protective plates as soon as possible.

1. Loosen the screws holding the pilot stage to the main stage to permit air to enter the pilot ports. If this is not done, suction will inhibit removal of the main stage spool.
2. Note the number of threads showing on the LVDT (typically 1 to 1-1/2) or take a depth measurement. Loosen the locknut and remove the LVDT. Remove the LVDT end cap and label the exposed end of the main stage body (usually where the serial number is stamped) “LVDT side.”

Note *Spool stops fit very tight into the bore. If it is not possible to remove the LVDT spool stop by grasping it and pulling, remove the drain end cap and lightly tap the anti-rotate lug on the drain end to ease the LVDT spool stop out of the bore. Restrain the spool so that it does not slide through the bore when the spool stop is removed.*

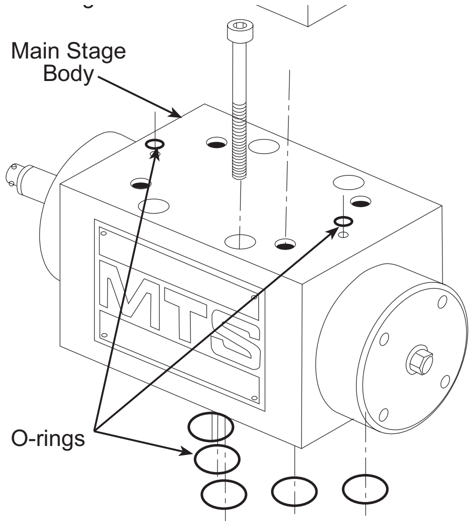
3. Remove the screws holding the LVDT spool stop to the main stage body. Remove the LVDT spool stop. Mark the spool stop to indicate it was removed from the LVDT end. Spool stops should not be interchanged.

⚠ CAUTION

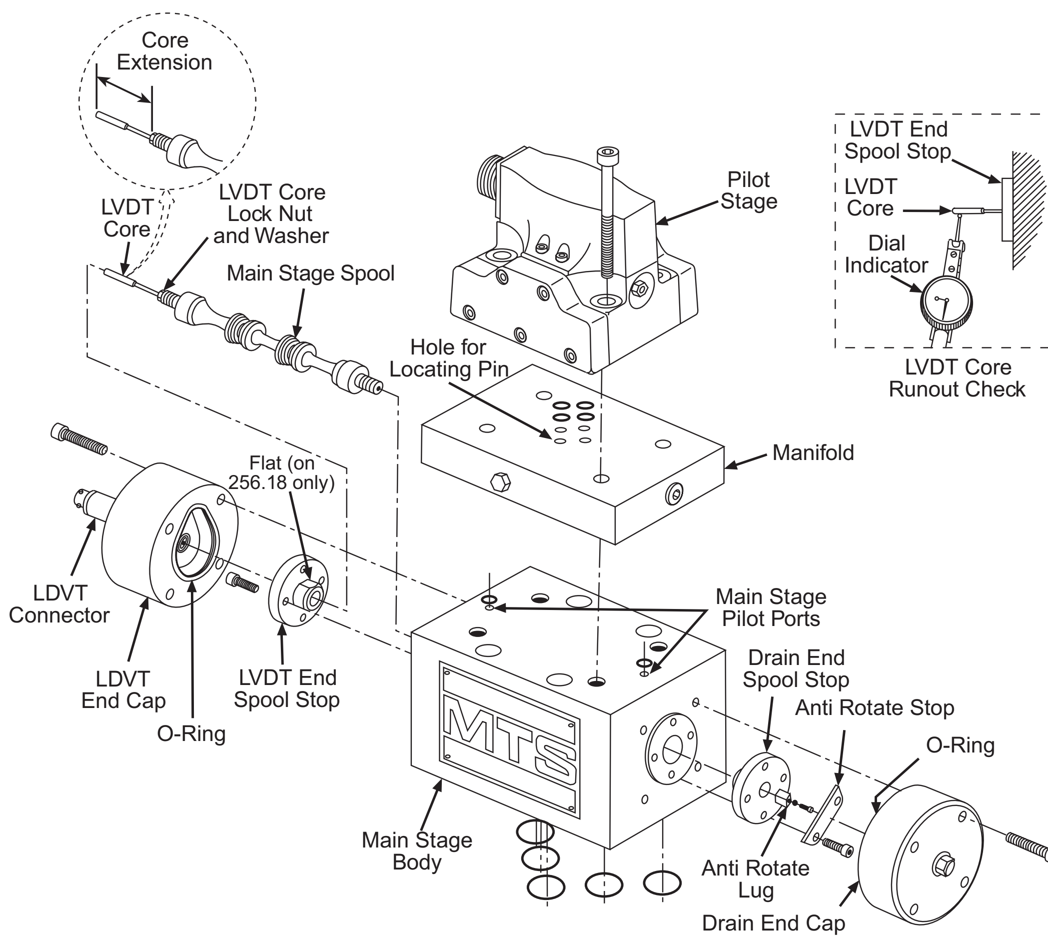
The spool can be damaged when it is handled.

If not supported on both ends, the spool may bind in the bore and damage the spool.

Support the spool at both ends during removal and reassembly.



Mounting Screw Locations



Main Stage Disassembly

4. Remove the spool by pulling on the LVDT core. Do not pull hard, it should be possible to remove the spool from the main stage body with little or no difficulty.
5. Remove the drain end spool stop and anti-rotate stop.
6. Examine the internal spool-contacting edges and surfaces of the main stage body, and milled surfaces of the spool for nicks and burrs. Milled surfaces should be perfectly smooth.
7. Dip the spool in clean hydraulic fluid and insert it into the servovalve body. The serial number on the spool must be at the serial number end of the servovalve body.
8. Slide the spool back and forth by means of the LVDT core. It should slide freely without binding.
9. Inspect the O-rings on the end caps and install new ones if damaged.
10. Inspect the LVDT transformer/connector O-ring and replace if damaged.

Assembling the Main Stage

To assemble the main stage of the servovalve perform the following procedure. Refer to the figure "Main Stage Disassembly" on page 25 during the following procedure.

⚠ CAUTION

The spool can be damaged when it is handled.

If not properly guided, the spool can slip through or bind in the bore and damage the spool.

Do not allow spool to slide uncontrolled through the spool bore or to bang against the inside edges of the main stage body. Tape one end of the spool bore so the spool does not slide through; support as much of the spool as possible until fully inserted.

1. Dip the spool in clean hydraulic fluid and insert it into the main stage body.

Note *Spool stops should not be interchanged between the ends of a particular servovalve body. Spools and spool stops are not interchangeable between different servovalves even though they might appear to fit.*

Both spool stops for a Model 256.18 servovalve must be installed so that the flat on the spool stop lines up with the pilot port in the bore of the main stage valve body. If assembly is incorrect, the spool will still move freely but performance will be severely reduced.

2. Slide the spool far enough out of the drain end of the servovalve body to permit putting the drain end spool stop over the end of the spool. With the spool stop in place, use the spool as a guide to slide the spool stop into the servovalve body. Install the anti-rotate lug.
3. Guide the LVDT end spool stop over the LVDT core and slide the spool stop into the servovalve body.
4. Check the LVDT core runout with a dial indicator. Grasp the anti-rotate lug on the drain end of the spool and slowly rotate it while monitoring the dial indicator. Adjust the LVDT core (by gently forming) so that the total runout indicated is 0.254 mm (0.010 in) or less.
5. Install the spool stop screws on the LVDT end. Install the anti-rotate stop and spool stop screws on the drain end (see the table on the next page for torque values).
6. Install the drain end cap on the servovalve (see the table on the next page for torque values).
7. Install the LVDT transformer/connector and tighten the LVDT locknut hand tight. The same number of threads should be showing or the same depth obtained as noted in Step 2 on page 24.

All of the servovalve components use 4 socket head screws (except eight socket head screws are needed to mount the spool stop). Tighten all screws in increments. Start by tightening one, then the one opposite it, then the ones in between until all are tightened to the specified torque.

Socket Head Screws (quantity)	Servovalve Models				
	256.04	256.09	256.18	256.25	256.40
Spool Stop (8)	3.95 N·m (35 lbf·ft)	3.95 N·m (35 lbf·ft)	3.95 N·m (35 lbf·ft)	12.20 N·m (108lbf·in)	12.20 N·m (108lbf·in)
Drain End Cap (4)	12.20 N·m (108lbf·in)	12.20 N·m (108lbf·in)	12.20 N·m (108lbf·in)	47.45 N·m (35 lbf·ft)	47.45 N·m (35 lbf·ft)
LVDT End Cap (4)	12.20 N·m (108lbf·in)	12.20 N·m (108lbf·in)	12.20 N·m (108lbf·in)	47.45 N·m (35 lbf·ft)	47.45 N·m (35 lbf·ft)
Main Stage Mounting† (4)	47.45 N·m (35 lbf·ft)	47.45 N·m (35 lbf·ft)	47.45 N·m (35 lbf·ft)	12.20 N·m (108lbf·in)	12.20 N·m (108lbf·in)
Pilot Stage Mounting (4)	24.40 N·m (18 lbf·ft)	24.40 N·m (18 lbf·ft)	24.40 N·m (18 lbf·ft)	24.40 N·m (18 lbf·ft)	24.40 N·m (18 lbf·ft)

* Tighten all screws in sequence. Tighten one, then the one opposite it, then the ones in between until all are tightened to the specified torque.

† The 256.04 has 3 main stage mounting socket head screws

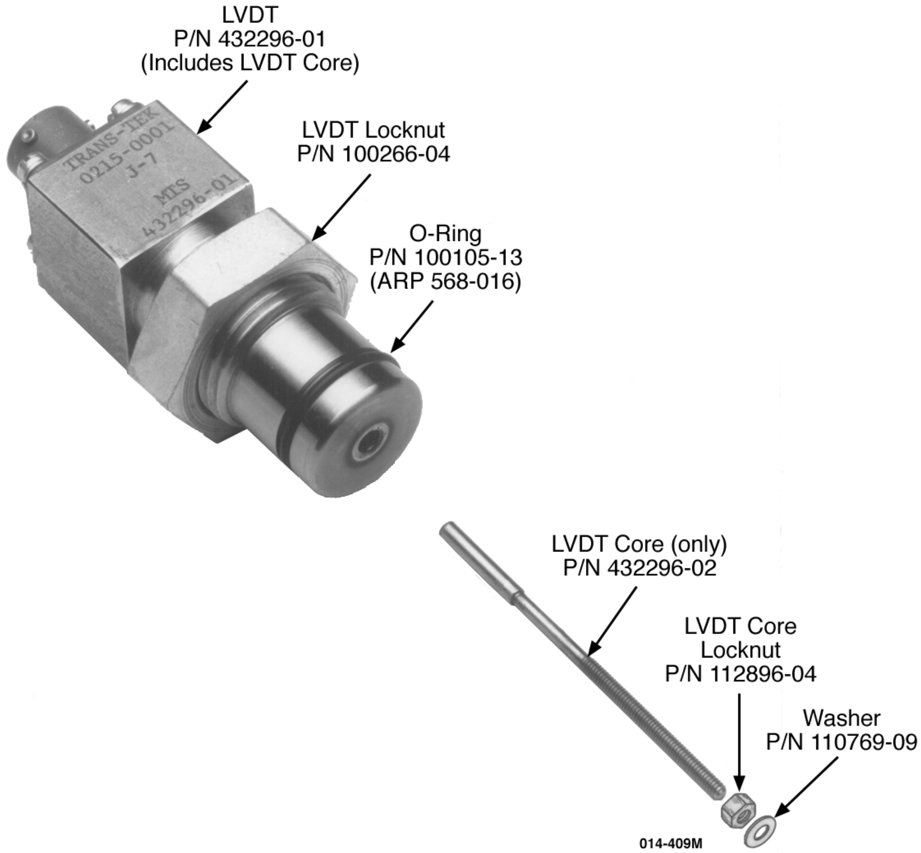
LVDT Core Extensions

The LVDTs used in all 256 Servovalves are similar except that the cores extend different lengths from the spool end, through the end cap, and into the LVDT transformer. These lengths are shown in the following table.

Model Number	Core Extension*†
256.04	35.5 mm (1.4 in)
256.09	35.5 mm (1.4 in)
256.18	35.5 mm (1.4 in)
256.25	40.6 mm (1.6 in)
256.40	40.6 mm (1.6 in)

* Core extension is the length the core extends from the end of the spool to the outer end of the core.

† The linear range is ±6.35 mm (0.25 in).



LVDT Assembly

Setting the LVDT Mechanical Null

This procedure describes how to adjust the LVDT mechanical null for the Series 256 Servovalve. If the main stage of the servovalve has been disassembled or the valve balancing procedure (electrical compensation) results are judged unsatisfactory and the pilot valve mechanical null adjustment is inadequate.

Prerequisites

MTS Systems Corporation recommends that you read this procedure before attempting to adjust the mechanical null. The mechanical null adjustment is quite sensitive, and you should be familiar with the hazards that can be encountered when performing the procedure.

Perform the LVDT mechanical null adjustment after the valve balancing procedure (electrical compensation) has been completed and the results are judged unsatisfactory.

Perform the LVDT mechanical null adjustment after adjusting the mechanical null procedure for the pilot valve (see the *Series 252 Servovalve Product Information* manual).

During the servovalve mechanical null adjustment procedure, the actuator must be able to move through full displacement in either direction without contacting a reaction surface.

Valve balance adjustments

MTS controllers have an electronic mechanical null adjustment called valve balance. The valve balance adjustment is a convenient way to compensate for a servovalve that needs a mechanical null adjustment. The adjustment introduces an electrical offset signal that causes the servovalve to hold the position of the actuator when a zero command is issued.

⚠ WARNING

The displacement of the actuator is a crush zone.

Sudden and unexpected actuator rod movement can cause serious injury to personnel and/or damage to equipment.

Ensure that all personnel, specimen/structures, and tools are not in the path of the actuator (crush zone).

1. **Exercise the Actuator**

   The actuator should be exercised to warm it up. Electrical and mechanical adjustments are more repeatable after the actuator is warmed up.

   A. Select displacement control for the controller.

   B. Disable the reset integrator or adjust the Reset control for zero.

   C. Adjust the actuator for mid-displacement.

   D. Turn on electrical and hydraulic system power.

E. Define a 50%, 0.1 Hz sine wave command and allow the actuator to warm up for approximately one-half hour.

F. After the warm up period, stop the test program.

2. Monitor the LVDT Output

For this step, set up your controller to monitor the LVDT signal from the servovalve.

A. Select low hydraulic pressure at the HSM. Ensure the HPU is set for high hydraulic pressure to maintain pilot pressure.

B. Adjust the actuator to full retraction and full extension while noting the LVDT signal.

C. Adjust the actuator to mid-displacement.

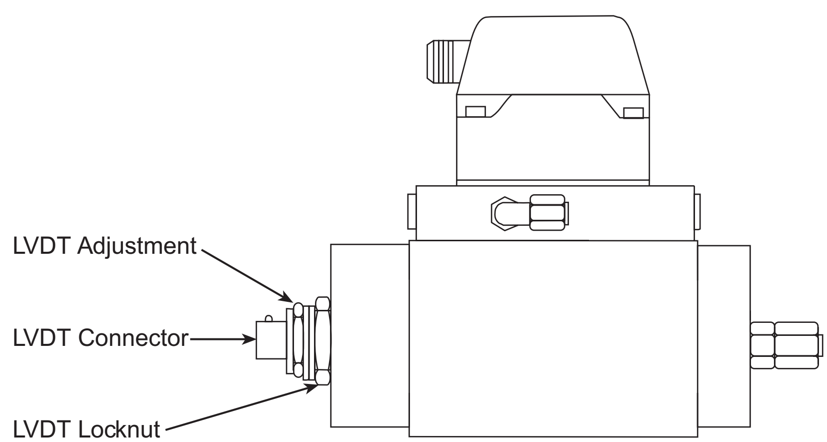
If the LVDT signal is balanced between ±10 V DC and the LVDT signal is zero volts at mid-displacement, no adjustment is necessary. If not, continue to the next step.

Note *Do not remove the LVDT locknut or LVDT in the next step. If removed, hydraulic fluid will spray from the servovalve.*

3. Adjust the LVDT null position

For this step, set up your controller to monitor the LVDT signal from the servovalve.

A. Loosen the LVDT locknut and turn the LVDT adjustment into or out of the servovalve, to obtain 0.000 V DC (±50 mV) at null.



B. Observe the LVDT dc signal while tightening the LVDT locknut to make sure the LVDT adjustment does not move. Sufficiently tighten the locknut to prevent any loosening during operation.

4. Finish the procedure

After completing the mechanical null adjustment, check, and if necessary, perform the electronic null adjustment (valve balance procedure) in the appropriate controller manual.