

## **Appendix S**

### Thunderco Control Valve Information and Interview Notes

Pipeline Rupture and Fire  
Bellingham, Washington  
June 10, 1999  
DCA-99-MP-008

**Romba, Gerald**

**From:** Grauel, Karen  
**Sent:** Tuesday, March 17, 1998 11:30 AM  
**To:** Romba, Gerald  
**Subject:** FW: Extended Close Piston Stop for Control Valves

OPL agrees with Thunderco stops as you indicated. You can tell Thunderco to proceed.

**From:** Hammett, Cameron C[SMTP:hammecc@texaco.com]  
**Sent:** Tuesday, March 17, 1998 10:05 AM  
**To:** Grauel, Karen  
**Cc:** Reed, Ron  
**Subject:** RE: Extended Close Piston Stop for Control Valves

I reviewed the P&ID's and talked to our mechanics. Our conclusion is that Thunderco's proposal of full close for the incoming valves and extended stops for the outgoing valves is the right way to go.

> ~~Original Message~~

> **From:** Grauel, Karen (SMTP:Karen.Grauel@Jacobs.com)  
 > **Sent:** Tuesday, March 17, 1998 6:31 AM  
 > **To:** 'hammecc@texaco.com'  
 > **Subject:** FW: Extended Close Piston Stop for Control Valves

> Had this bounce back a few times, then saw that your email address is  
 > 'hammecc@texaco.com' NOT 'hammeticc@texaco.com' as you indicated in your  
 > email earlier this week. Hope this works, or I'll have to resort to the  
 > old-fashioned way and call you on the phone!

> **From:** Grauel, Karen  
 > **Sent:** Monday, March 16, 1998 2:08 PM  
 > **To:** 'hammeticc@texaco.com'  
 > **Subject:** FW: Extended Close Piston Stop for Control Valves

> This failed to go through this morning. Trying again.

> **From:** Grauel, Karen  
 > **Sent:** Monday, March 16, 1998 6:43 AM  
 > **To:** 'hammeticc@texaco.com'  
 > **Cc:** Romba, Gerald; Reed, Ron  
 > **Subject:** FW: Extended Close Piston Stop for Control Valves

> Craig, Thunderco is providing piston stops on control valves as described  
 > below - full closure on incoming control valves and extended stops on  
 > outgoing control valves. This is what Thunderco typically provides for  
 > OPL

> Please confirm this is acceptable.

> **From:** Romba, Gerald  
 > **Sent:** Thursday, March 12, 1998 3:11 PM  
 > **To:** Grauel, Karen  
 > **Cc:** Reed, Ron  
 > **Subject:** Extended Close Piston Stop for Control Valves

> Rick Edrington called me from Thunderco. He said that at most pump  
 > stations, it is practice to have full closure on incoming control valves  
 > and  
 > to install extended closed piston stops for outgoing control valves.  
 > These  
 > are physical stops on the valves to prevent full closure to avoid starting  
 > a  
 > pump against a full closed valve.

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} Just opposite of  
 understanding of  
 what was installed  
 Design: ANSI 600# No stop.  
 Installed: ANSI 300# stop  
 ANSI 600# stop - ACB  
 ANSI 300# - No STOP

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- > Rick would like to know if OPL wants the extended stops on outgoing
- > control
- > valves. (Thunderco is currently providing with extended stops)
- >
- > Could you find out if OPL would like these? I told him I would get back
- > in
- > a week with an answer.

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BPT - FERNDALE INLET CONTROL VALVE

GENERAL	1	Tag No.	Item No.	CV-1904			
	2	Requisition Item No.					
	3	P&ID No.	Reference Sketches	D-1902			
	4	Service		Inlet control valve			
	5						
BODY	6	Body Size	Trim Size	10 in			
	7	Valve Type	Body Material	Ball / Rotary	Carbon Steel		
	8	Connections & Rating	Bolting	600# RF Flange			
	9	Bonnet	Finish (µINS)				
	10	Packing	Lubrication & Isolation	Nitrile			
	11	Ball					
TRIM	12	Plug Material	Seat Material	ASTM 350LF2 CS w/Nickel Plating	Viton		
	13	Shaft Material	Trim Form	C-1018 Steel w/Nickel Plating	Full Port Ball		
	14	No. of Seats	Guiding				
	15	Characteristic	Flow tends to				
	16	Leakage Class	Trim No.	ANSI IV (standard)			
	17						
ACTUATOR	18	Actuator Type	Model No.	Electro-Hydraulic	QT-10.140		
	19	Mounting Position	Size				
	20		Air Failure		Last Position		
	21						
	22						
ACCESSORIES	24	Position Transmitter	I/H Interface	PX-3.1	9020		
	25	Signal Input	Signal Output				
	26	Gauges	Bypass				
	27	E/H Unit	Reservoir	HPA-3000	35 Gallon		
	28	Motor Size	Power Required	5 HP X 1800 RPM	3 Phase 230/460		
	29	Pump	Filter	6 GPM	Yes		
	30	Accumulator		2.5 Gallon			
	31	Hand Pump	Auto-Manual Station	Yes	Yes		
PROCESS DATA	32	Fluid	Phase	See Note 3	Liquid		
	33	Corrosive	Erosive	Fouling Material			
	34			Units	@ Max. Flow	@ Norm. Flow	@ Min. Flow
	35	Flow Rate @ Norm. T		US bbl/h			
	36	Pressure Drop @		psi			
	37	Inlet Pressure @		psi-g			
	38	Temperature		°F			
	39	Cv Calc. @		—			
	40	Valve Opening		%			
	41	Sound @		dba			
	42	Δ P @ Shut-Off		1480	psi		
	43	Design Pressure	Design Temperature	1480	psi-g	100	°F
	44	Vapour Pressure	Critical Pressure		psi-g		atm(stand)-g
	45	S. G. @ 15°C	S. G. @ Conditions				
	46	Viscosity @ Op.	M.W. Gas		cP		
	47	Sp Heat Ratio Cp/Cv	Z				
	48	Line Size and Sch.	Reference Piping Drw	16 in	sch. 20	16-0-102-600A	
	49	Selected Valve Cv					
	50	Cavitating Service	Valve Cm, Ct, Fi, Ci				
	51			Valve	Positioner	Transducer	
	52	Manufacturer		GROVE			
	53	Model		10" RFFE ANSI 600 B			
	<p>Notes: 1. Wetted parts must be suitable for 15% MTBE service.          2. Electrical equipment must be rated and UL listed Explosionproof for Class 1 Div. 1 Group D except for the 9020 module, which is Nema 1.          3. Fluids are gasoline and diesel fuel. See attachment for operating process data.</p>						
				INSTRUMENT SPECIFICATION			
0	GR	11/17/97	FOR PURCHASE	Control Valve style 2			
B	GR	9/17/97	RE-ISSUED FOR BID				
A	GR	9/5/97	FOR BID			Sheet of	
No.	By	Date	Revision	Code: 62	Dwg. No.:	Rev.: 0	

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GENERAL	1   Tag No.	Item No.	CV-1963	
	2   Requisition Item No.			
	3   P&ID No.	Reference Sketches	D-1903	
	4   Service		Outlet control valve	
	5			
BODY	6   Body Size	Trim Size	10 in	
	7   Valve Type	Body Material		Carbon Steel
	8   Connections & Rating	Bolting	300# RF Flange	
	9   Bonnet	Finish (µINS)		
	10   Packing	Lubrication & Isolation	Nitrile	
	11			
TRIM	12   Ball Material	Seat Material	ASTM 350LF2 CS w/Nickel Plating	Viton
	13   Shaft Material	Trim Form	C-1018 Steel w/Nickel Plating	Full Port Ball
	14   No. of Seats	Guiding		
	15   Characteristic	Flow tends to		
	16   Leakage Class	Trim No.	ANSI IV (standard)	
	17			
ACTUATOR	18   Actuator Type	Model No.	Electro-Hydraulic	QT-10.140
	19   Mounting Position	Size		
	20	Air Failure		Last Position
	21			
	22			
	23			
ACCESSORIES	24   Position Transmitter	I/H Interface	PX-3.1	9020
	25   Signal Input	Signal Output		
	26   Gauges	Bypass		
	27   E/H Unit	Reservoir	HPA-3000	35 Gallon
	28   Motor Size	Power Required	5 HP X 1800 RPM	3 Phase 230/460
	29   Pump	Filter	6 GPM	Yes
	30   Accumulator		2.5 Gallon	
	31   Hand Pump	Auto-Manual Station	Yes	Yes
PROCESS DATA	32   Fluid	Phase	See Note 3	Liquid
	33   Corrosive	Erosive	Fouling Material	
	34		Units	@ Max. Flow @ Norm. Flow @ Min. Flow
	35   Flow Rate @ Norm. T		US gal/min	
	36   Pressure Drop @		psi	
	37   Inlet Pressure @		psi-g	
	38   Temperature		°F	
	39   Cv Calc. @		—	
	40   Valve Opening		%	
	41   Sound @		dBA	
	42   Δ P @ Shut-Off		740 psi	
	43   Design Pressure	Design Temperature	740 psi-g	100 °F
	44   Vapour Pressure	Critical Pressure	psi-g	psi-g
	45   S. G. @ 15°C	S. G. @ Conditions		
	46   Viscosity @ Op.	M.W. Gas	cP	
	47   Sp Heat Ratio Cp/Cv	Z		
	48   Line Size and Sch.	Reference Piping Drw	16 in sch. STD	16-0-125-300A
	49   Selected Valve Cv			
	50   Cavitating Service	Valve Cm, Ct, Fi, Ci		
	51		Valve	Positioner Transducer
	52   Manufacturer		GROVE	
	53   Model		10" RFFE ANSI 300 B	
	Notes: 1. Wetted parts must be suitable for 15% MTBE service. 2. Electrical equipment must be rated and UL listed Explosionproof for Class 1 Div. 1 Group D except for the 9020 module, which is Nema 1. 3. Fluids are gasoline and diesel fuel. See attachment for operating process data.			
				INSTRUMENT SPECIFICATION
				Control Valve style 2
				JE1 0021939
0	GR	11/17/97	FOR PURCHASE	Sheet of
B	GR	9/17/97	RE-ISSUED FOR BID	
A	GR	9/5/97	FOR BID	
No.	By	Date	Revision	Code: 62 Dwg. No.: Rev.: 0



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# Fax

**To:** Allen Beshore, NTSB **From:** Rick Edrington

---

**Fax:** (202) 314-6482 **Pages:** 20

---

**Phone:** (202) 314-6201 **Date:** 2/13/2002

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**Re:** QT-10 Maintenance Manual **CC:**

- Urgent     For Review     Please Comment     Please Reply

● **Comments:**

Allen,

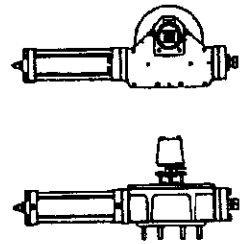
Attached is the manual (Doc. # -027-0029-1092) requested, I was unable to create a .pdf as discussed. I also included drawing (Drw. # 018-0043-A) detailing the close stop options available. P/N 030-0238 is the restricted close stop supplied.

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# Model QT-10 Single Cylinder Actuator

**Document No. 027-0029-1092**  
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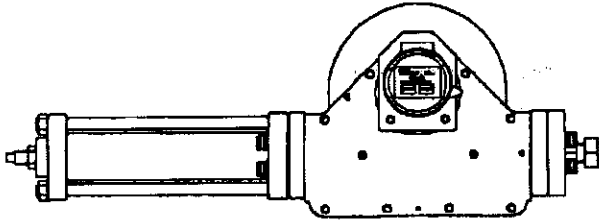
This document replaces all previous editions.

## Contents

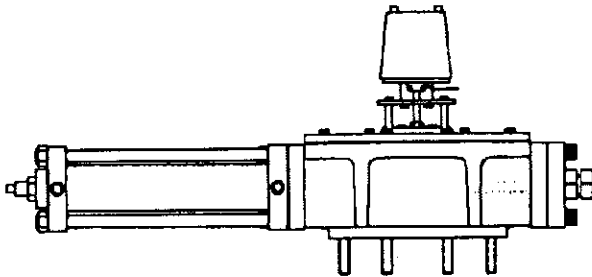
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## Model QT-10 Single Cylinder Actuator

### Description



*Top view, QT-10.125 actuator with no options*



*Front side view, QT-10.125 actuator*

The QT-10 actuator is a 90 degree rotational actuator designed to operate ball, plug and butterfly valves as well as other control devices such as dampeners, etc. in a modulating or on/off application with a high pressure hydraulic power supply or high pressure line gas.

This is an explanation of maintenance procedures for the QT-10 series actuator which is one of a series of Thunderco valve actuators.

### Applications

- High Pressure Gas Powered Actuation of ESD valves
- High Pressure Gas Powered Modulation of Quarter Turn Control Valves
- Model QT-Series Single Cylinder Actuators High Pressure Hydraulic Powered Actuation of ESD Valves
- High Pressure Hydraulic Powered Modulation of Quarter Turn Control Valves

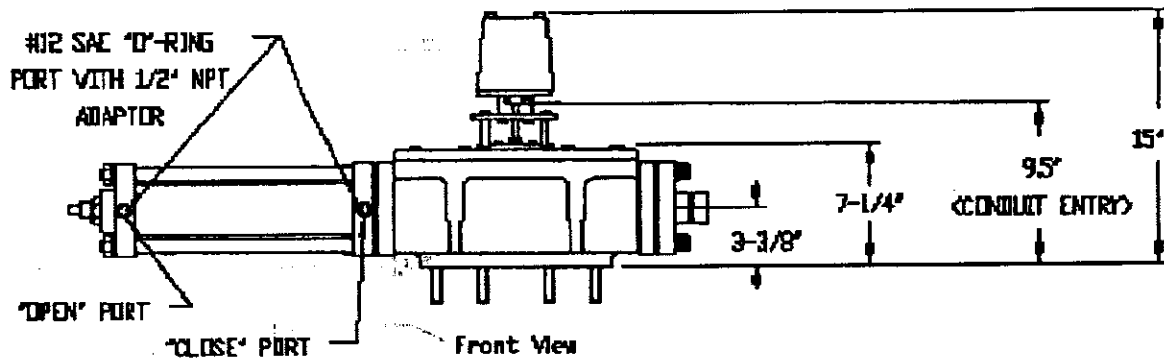
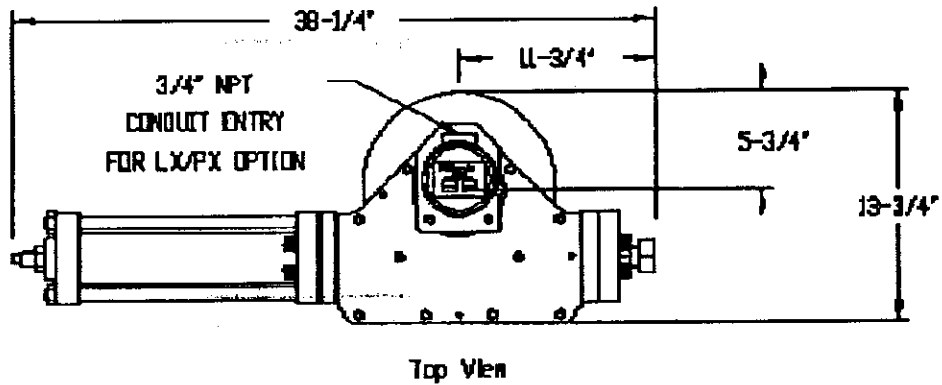
A variety of actuator mounted and/or stand alone control options are available. See information concerning our gas powered G-4000 and G-5000

ESD Systems as well as our T-3000 and T-9000 Electro/Hydraulic Valve Control and Positioning Systems.



## Model QT-10 Single Cylinder Actuator

### Dimensions



### Specifications

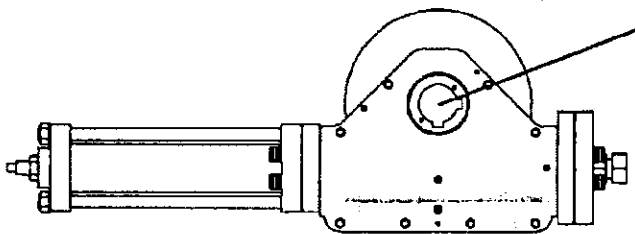
Maximum Operating Pressure:	2000 PSI
Normal Operating Pressure:	Dependent on system design 400-600 psi typical for HPA-1500 based systems 800-1000 psi typical for HPA-3000 based systems
Maximum Torque:	30,000 inch pounds (QT-10.125 @ 1500 psi) 75,000 inch pounds (QT-10.140 @ 1500 psi)

## Model QT-10 Single Cylinder Actuator

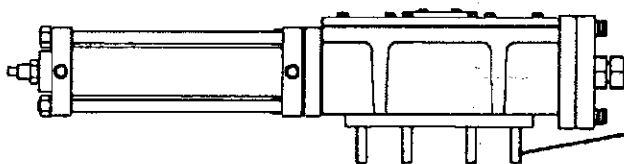
### Mounting

Make sure that the actuator and valve are in the same position.

Keyway at 3 o'clock is for horizontal mounting in line with pipeline. Keyway at 6 o'clock is for vertical mounting or mounting across the pipeline.



Top view, QT-10 series actuator shown in open



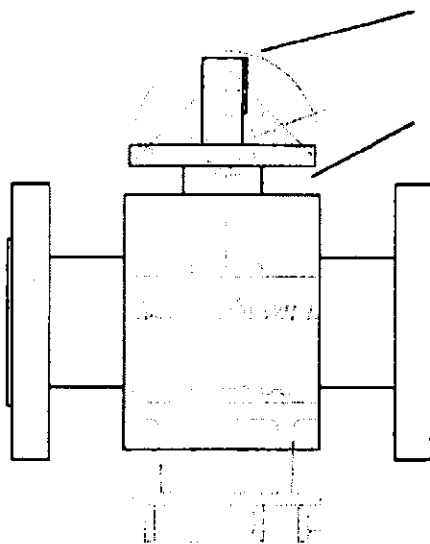
Side view, QT-10 series actuator

Install studs in operator, do not exceed 3/4" penetration with the early QT-10 Series actuator or gear head may jamb.

Install gasket or gasket sealer between the actuator and valve mounting flange.

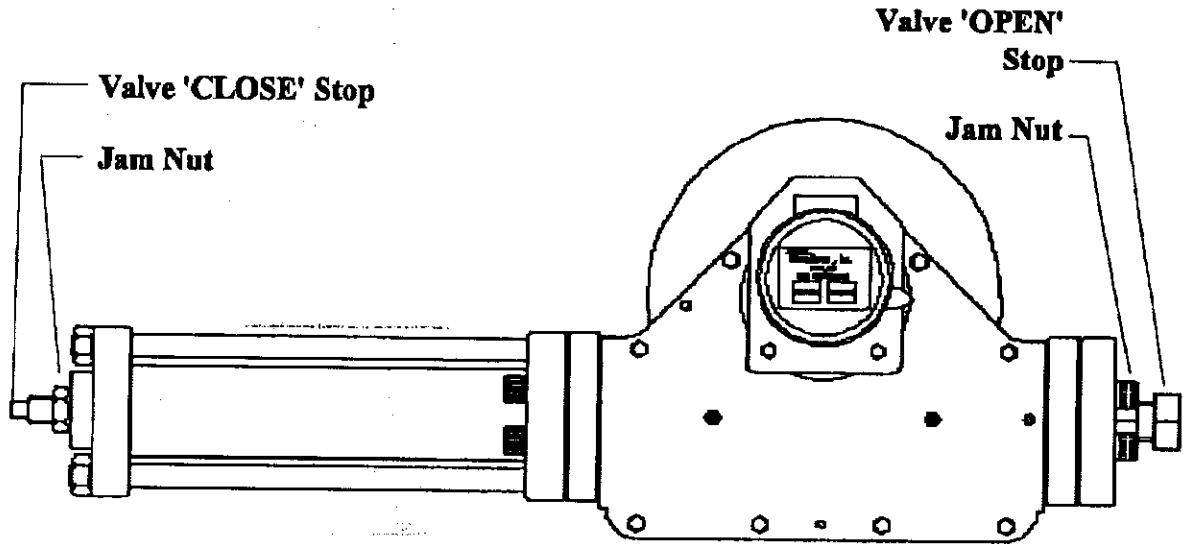
Grease the valve stem and slip the actuator over it.

Install and tighten nuts. Lock washers are recommended.



## Model QT-10 Single Cylinder Actuator

### Travel Stops



*Top view, QT-10 Series actuator shown in open position*

The travel stops are adjusted at our factory if actuator/valve assembly was provided by Thunderco.

Field adjustments can be done by loosening the corresponding jam nut and adjusting the appropriate stop screw until desired valve travel is achieved.

Always set actuator stops to impact prior to internal valve stops to eliminate possible valve stem damage.

The valve 'CLOSE' stop cannot be unscrewed completely from the outside however it can be screwed in too far. Do not screw in more than 1-1/2" from its fully out position or leakage may result around the sealing "o"-ring.

An extended valve 'CLOSE' and/or 'OPEN' stop is available if full valve travel is not desired. Ask Thunderco personnel for details.

## Model QT-10 Single Cylinder Actuator

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### Trouble Shooting

<u>Problem</u>	<u>Solution</u>
1) Hydraulic fluid loss due to leaks from piston rod seals.	Refer to instruction for cylinder disassembly/assembly.
2) Hydraulic fluid loss at end plate seals.	Follow instructions for cylinder disassembly/assembly. Coat end plate seals, item (19), with a thick grease to insure that the end plate "O"-rings seat against the polished cylinder walls.
3) Apparent slop in scotch yoke mechanism upon operator lid removal.	Follow procedures for mainframe disassembly. Rotate bearing blocks, item (13), 90 degrees to renew bearing surface and inspect slots in torque arm, item (11), for wear.
4) Non-operational.	Insure minimum supply pressure and correct operation of controls. Remove lid and inspect mainframe internal parts for wear or corrosion. On the QT-10 or QT-1510 if the mounting stud is screwed in more than 3/4" it may jam the internal mechanism.

## Model QT-10 Single Cylinder Actuator

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### Recommended Tools

The following tools are recommended for complete actuator maintenance.

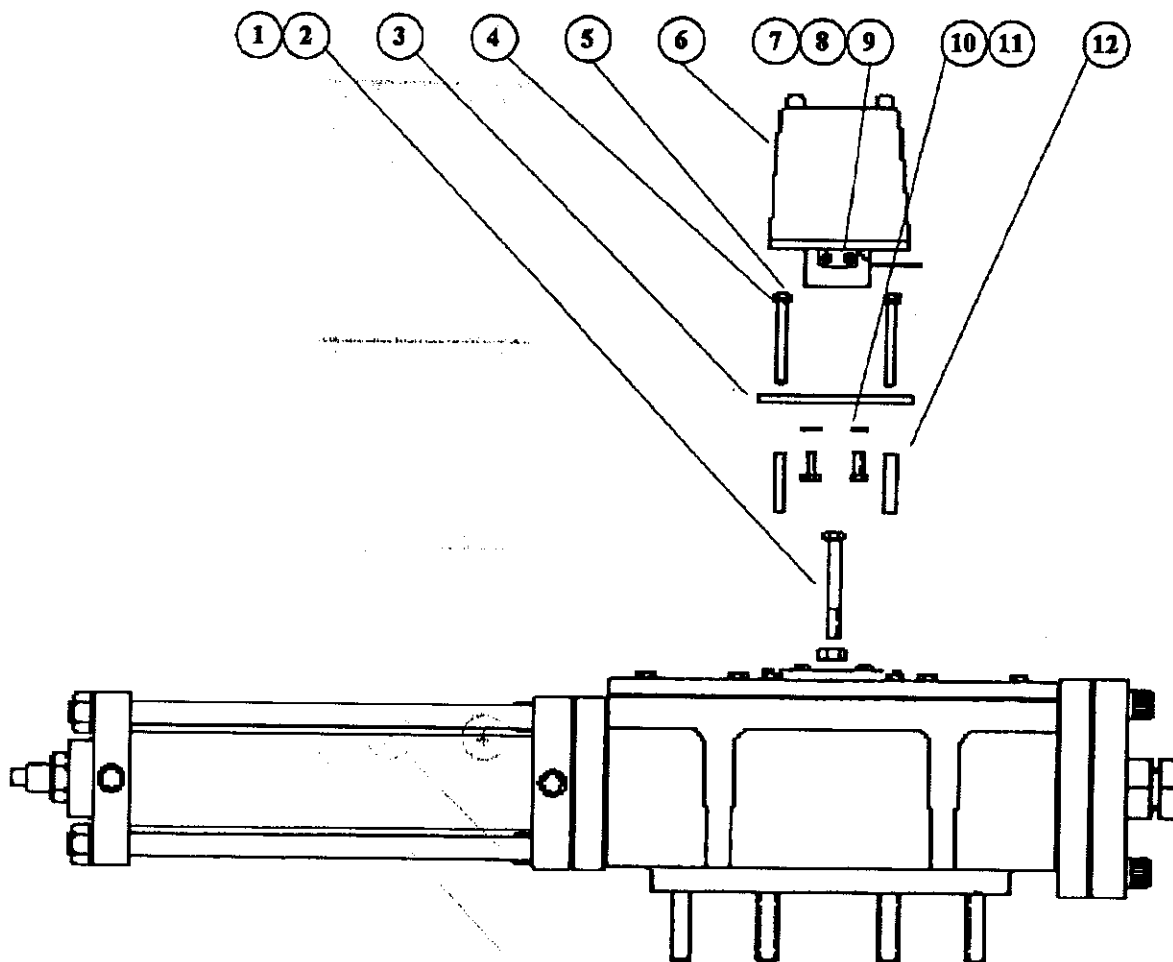
ratchet wrench with extension  
pneumatic/electric impact wrench-optional  
strap wrench  
hammer and punch  
channel lock pliers  
1/4" blade screw driver  
7/16" socket  
9/16" socket  
12" adjustable crescent wrench  
1/2" socket  
11/16" socket  
1-1/8" deep socket  
1/2" allen wrench  
.047" dia. tip internal snap ring pliers  
.070" dia. tip external snap ring pliers

### Inspection and Renewal-Initial Conditions

- 1) Place valve in a closed to mid position.
- 2) Relieve all hydraulic/pneumatic lines attached to operator of any fluid pressure and plug cylinder ports to minimize fluid loss.

## Model QT-10 Single Cylinder Actuator

### Model PX/LX Removal



*Side view, QT-Series IXX actuator shown with  
Model PX/LX Transmitter/Limit Switch Pack Option*

- 1) Loosen flag clamp screws (8).
- 2) Remove screws (5) retaining Model PX/LX mounting plate (3). Note the orientation of the flag to the feedback screw (1) and remove mounting plate (3) and Model PX/LX from valve.

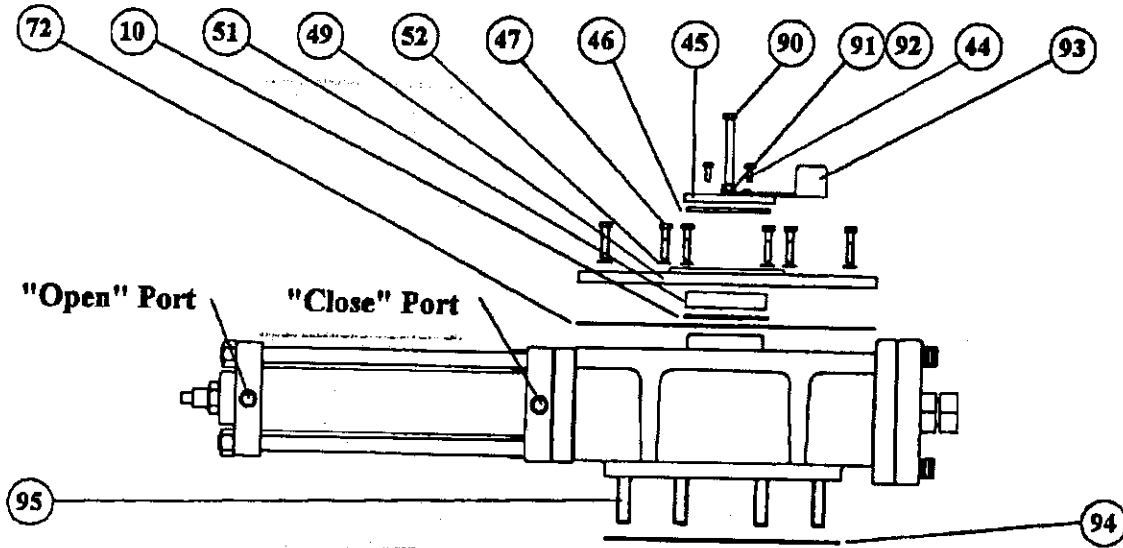
## Model QT-10 Single Cylinder Actuator

### Part List, PX/LX Adaptor Assembly

Item	Qty	Part Number	Description
BM	1	020-0154-B-T	PX/LX to QT-10 Mounting Assembly
1	1	200-6NCx2.12-SS-HCS	Screw, Hex Cap
2	1	201-6NC-CP-HSN	Nut, Sealing
3	1	005-0247-B-B	Plate, Mounting
4	2	202-4-SS-ETW	Lock Washer, External Tooth
5	4	200-4x2.8-SS-HCS	Screw, Hex Cap
6	1	020-0123-C-T	Model PX-3 Position Transmitter
or	1	092-0002-A-T	Model LX-1 Limit Switch Pack
7	1	005-0056-A-B	Flag, Indicator
8	2	200-#8-32x1.0-SS-SPH	Screw
9	2	202-#8-SS-SRL	Lock Washer, External Tooth
10	2	200-4x14-SS-HCS	Screw, Hex Cap
11	2	202-4-SS-ETW	Lock Washer, External Tooth
12	4	003-1.14-SS-STO	Standoff

## Model QT-10 Single Cylinder Actuator

### Lid Removal



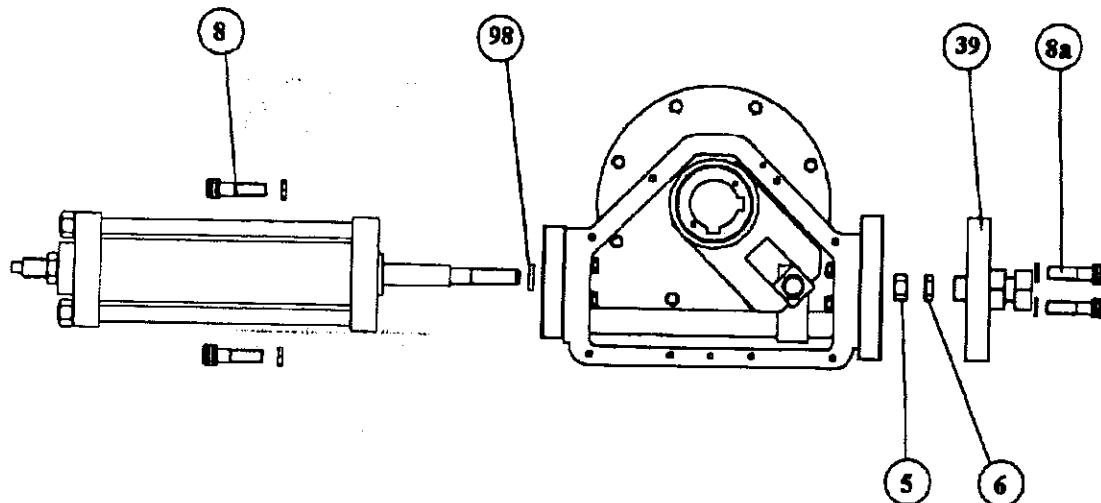
*QT-10 Actuator, Exploded Side View  
Refer to Gear Box Assembly Parts List*

- 1) Remove torque arm cover screws (44), torque arm cover (45) and its "o"-ring (46).
- 2) Remove lid screws (47) and lid (49) using jack up holes provided.



## Model QT-10 Single Cylinder Actuator

### Cylinder Removal



*QT-10 Actuator, Exploded Top View*

- 1) Place the valve in the closed or middle position if possible before this maintenance procedure is started.
- 2) On Model QT-1500s remove the HPA-1500 hydraulic unit from the actuator: See section on HPA-1500 for removal instructions and remove the "OPEN" stop assembly.
- 3) On Model QT-10s remove the four stop plate retaining screws, item 8a, and remove the actuator "open" stop, item 39, if present to expose the access hole. This is not required on Model QT-30/40s.
- 4) Using a deep socket or hammer and punch, remove the jam nut or set screws, item 6. If set screws are used be sure all are removed or piston rod thread damage may result.
- 5) Remove the piston rod retaining nut, item 5, using the same deep socket or hammer and punch. Some models may have a locknut in place of a jam and hex nut. If the piston rod has to be held to remove it use a strap wrench if available, be sure not to scar the surface in a critical sealing area and remove any burrs on the piston rod before cylinder reassembly.
- 6) Remove the four cylinder retaining screws, item 8, and withdraw entire cylinder.
- 7) Observe if spacing washers, item 98, are present and put aside for re-assembly.

*QT-10*

*QT-10*

*QT-10*

*QT-10*

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*QT-10*

**Thunderco, Inc.**

*QT-10*

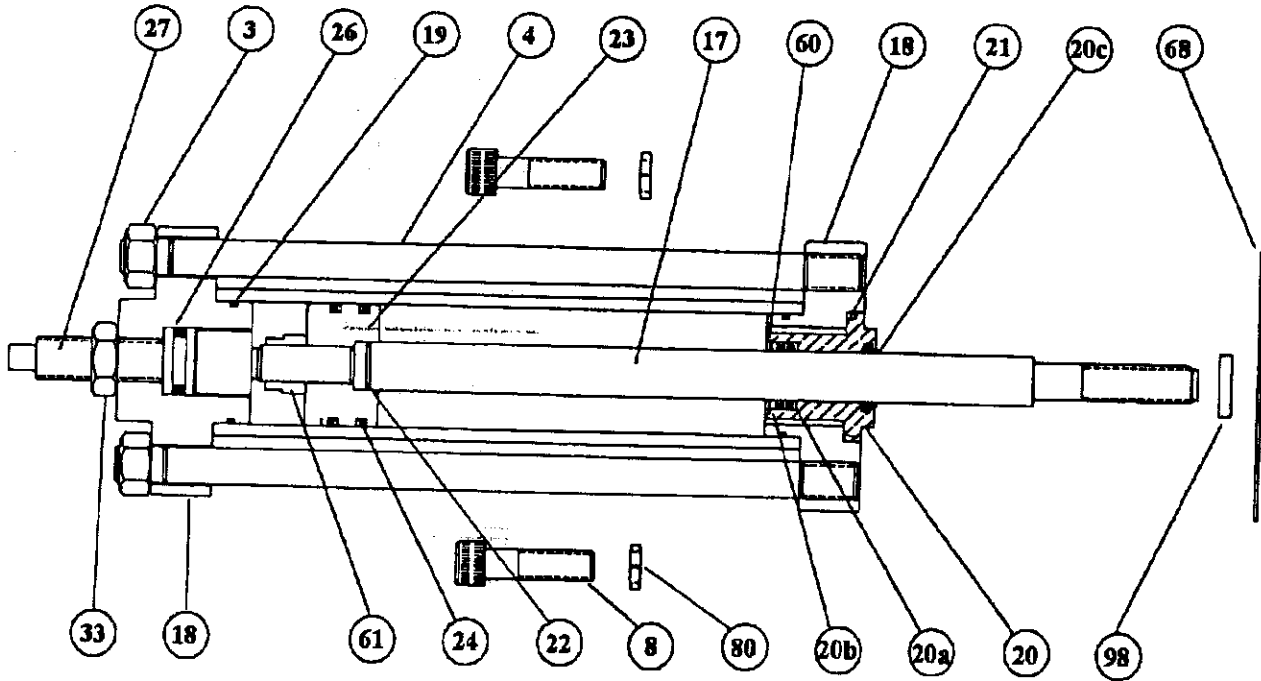
*QT-10*

*QT-10*

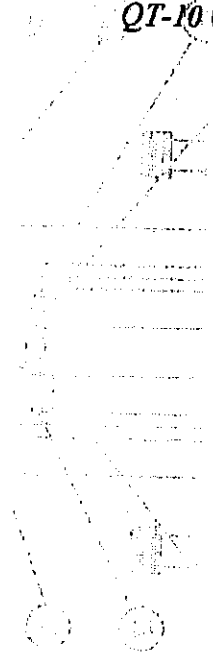
Hydraulic Actuators QT-10-11

# Model QT-10 Single Cylinder Actuator

## Assembly-Cylinder



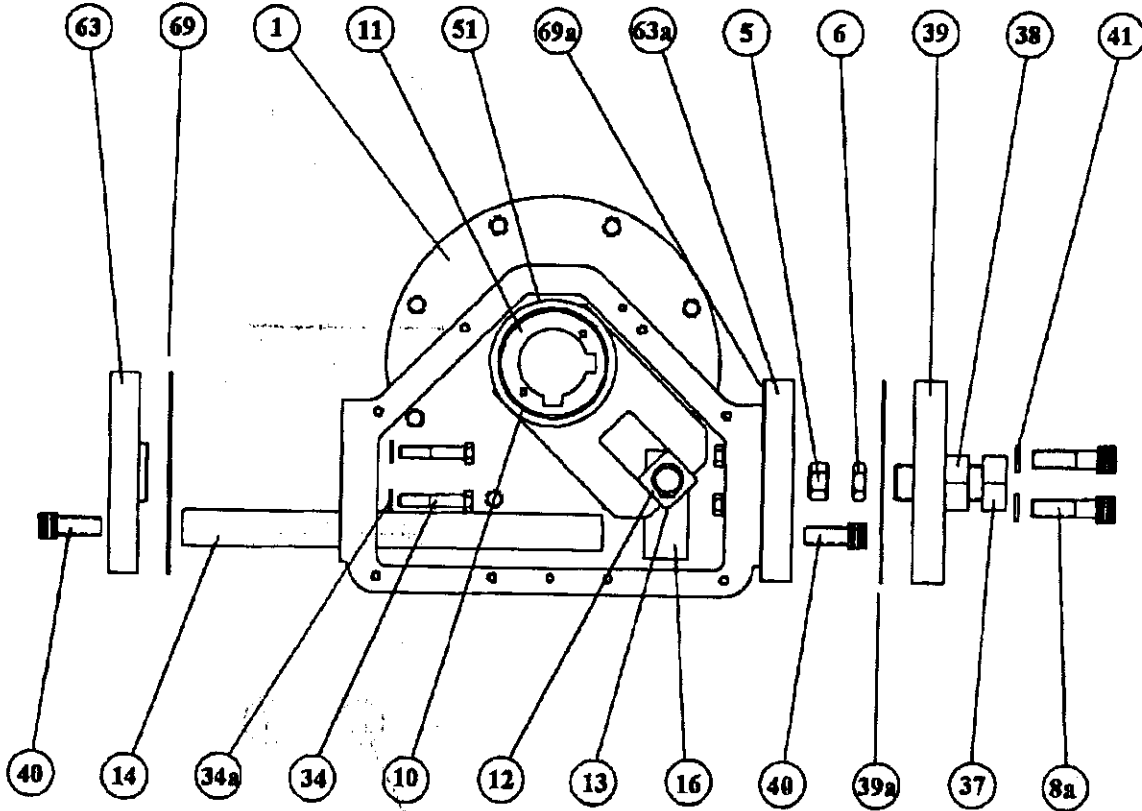
*QT-10 Cylinder, Exploded View*



*QT-10*

# Model QT-10 Single Cylinder Actuator

## Assembly-Gear Box



QT-10 Gear Box, Exploded View

### Model QT-10 Single Cylinder Actuator

#### Parts List, Actuator Assembly

ITEM	QTY	PART NUMBER	DESCRIPTION	
BM	1	Model QT-10.125-E	Model QT-10.140-E	Assembly, QT-10.1XX & QT-1510.XX Act
1	1	007-0020-E-B	007-0020-E-B	Mainframe
3	4	201-12NCxG8-ZP-HN	201-12NCxG8-ZP-HN	Hex Nut
4	4	030-0141-A-B	030-0141-A-B	Tie Rod
5	1	201-12NCxG8-ZP-HN	201-12NCxG8-ZP-HN	Nut, Piston Rod Retaining
6	1	201-12NC-CP-HJN	201-12NC-CP-HJN	Jam Nut, Piston Rod Retaining
8	4	200-10NCx2.4-BL-HSC	200-10NCx2.4-BK-HSC	Screw, Hex Socket Cap
8a	4	200-10NCx2.4-BL-HSC	200-10NCx2.4-BK-HSC	Screw, Hex Socket Cap
or		200-10NCx3.0xB7-ST	200-10NCx3.0xB7-ST	Stud, HPA-1500 Mounting
**10	2	054-0241-90N-S	054-0241-90N-S	Torque Arm Seal
or		054-0339-90N-S	054-0339-90N-S	Torque Arm Seal
11	1	007-0015-E-B	007-0015-E-B	Torque Arm (dependent on valve type)
12	2	046-5160.94-BK-ESR	046-5160.94-BK-ESR	Snap Ring, Heavy Duty
13	2	007-0021-A-B	007-0021-A-B	Bearing Piece
14	1	007-0005-B-B	007-0005-B-B	Side Load Bar
16	1	007-0014-B-C	007-0014-B-C	Side Load Yoke
17	1	030-0193-A-B	030-0193-A-B	Piston Rod
18	1	030-0118-C-B	030-0172-A-B	Cylinder Stop End Plate
18a	1	030-0121-A-B	030-0181-C-B	Cylinder Rod End Plate
*19	2	054-0141-70N-S	054-240-70N-S	Cylinder End Plate Seal
20	1	030-0192-A-B	030-0192-A-B	Rod Bushing/Seal Cartridge
*20a	2	053-18701000-P-S	053-18701000-P-S	Rod Seal
*20b	1	030-0158-A-A	030-0158-A-A	Packing Washer
*20c	1	057-D.1000-U-S	057-D.1000-U-S	Wiper
*21	1	054-0229-70N-S	054-229-70N-S	Rod Bushing/Seal Cartridge Seal
*22	1	054-0020-70N-S	054-0020-70N-S	Piston to Rod Seal
23	1	030-0120-C-B	030-0171-C-B	Piston
*24	2	053-18702125-U-S	053-18703625-U-S	Piston Seal
25	1	030-0140-A-B	030-0224-A-B	Cylinder Jug
*26	1	054-0318-70N-S	054-318-70N-S	Piston Stop Seal
27	1	030-0122-C-B	030-0122-C-B	Piston Stop
33	1	201-14NC-CD-HJN	201-14NC-CD-HJN	Hex Jam Nut
34	4	200-7NCx2.4xG8-HCS	200-7NCx2.4xG8-HCS	Screw, Adapter Plate Retaining
35	4	203-7-SS-ESW	203-7-SS-ESW	Star Washer
37	1	200-1.4NFx3.0xG8-CP-HCS	200-1.4NFx3.0xG8-CP-HCS	Screw, G8
38	1	201-1.4NF-CP-HJN	201-1.4NF-C-HJN	Jam Nut, Valve "Open" Stop Screw
39	1	007-0137-A-B	007-0137-A-B	Stop Plate (QT-10.1XX)
or		007-0149-A-B	007-0149-A-B	Stop Plate (QT-1510.XX)

## Model QT-10 Single Cylinder Actuator

### Parts List, Actuator Assembly (con't)

ITEM	QTY	PART NUMBER	DESCRIPTION	
BM	1	Model QT-10.125-E	Model QT-10.140-E	Assembly, QT-10.1XX & QT-1510.XX Ac
**39a	2	056-0008-B-B	056-0008-B-B	Stop/Adapter Gasket (QT-10.1XX)
or		056-0013-B-B	056-0013-B-B	Stop/Adapter Gasket (QT-1510.XX)
40	2	200-10NCx1.8-BK-HSC	200-10NCx1.8-BK-HSC	Screw, Side Load Bar
41	4	203-10-CP-HCL	203-10-CP-HCL	Washer, High Collar Lock
44	2	200-#4NCx12-SS-OPH	200-#4NCx12-SS-OPH	Screw, "O"-RING Pan Head
45	1	007-0151-A-B	007-0151-A-B	Torque Arm Cover
**46	1	056-0001-A-S	056-0001-A-C	Torque Arm Cover Seal
or		054-0241-90N-S	054-0241-90B-S	Torque Arm Cover Seal
47	8	200-5NCx1.4-SS-HCS	200-#10NCx1.4-SS-HCS	Screw, Lid
48	2	206-4x1.4-BK-DP	206-4x1.4-BK-DP	Dowel Pin (Not Shown)
49	1	007-0016-F-B	007-0016-F-B	Lid
51	2	058-0102-A-A	058-0102-A-A	Journal Bearing
52	8	203-5-SS-ESW	203-5-SS-ESW	Star Washer
*60	1	046-5008.137-BK-ISR	046-5008.137-BK-ISR	Snap Ring, Inverted
61	1	201-12NC-NP-HLN	201-12NC-NP-HLN	Flexlock Nut
63	1	007-0136-A-B	007-0138-A-B	Cyl/Stop Adaptor (Model QT-10.1XX)
63a	1	007-0136-A-B	007-0136-A-B	Cyl/Stop Adaptor (Model QT-10.1XX)
or		007-0138-A-B	007-0138-A-B	Cyl/Stop Adaptor (QT-1510.XX)
**66	1	056-0112-A	056-0013-B-S	Cylinder/Adapter Gasket
**69	1	056-0008-A-S	056-0013-B-S	Cyl/Stop Adaptor Gasket (Model QT-10.1)
**69a	1	056-0008-A-S	056-0008-B-S	Cyl/Stop Adaptor Gasket (Model QT-10.1)
or		056-0013-A-S	056-0013-B-S	Cyl/Stop Adaptor Gasket (Model QT-1510)
**72	1	056-0007-A-S	056-0007-A-S	Lid Gasket
80	4	203-10-CP-HCL	203-10-CP-HCL	Washer, Hi-Collar Lock
90	1	200-6NCx1.0-SS-HCS	200-6NCx1.0-SS-HCS	Screw
or		200-6NCx3.8-SS-HCS	200-6NCx3.8-SS-HCS	Screw (PX/LX Option)
91	1	201-6NC-CP-TSN	201-6NC-CP-TSN	Nut
93a	1	005-0011-A-B	005-0011-A-B	Position Indicator
93b	2	200-#10NFx8-SS-OPH	200-#10NFx8-SS-OPH	Screw, "O"-RING Pan Head
94	1	---	Varies with valve type	Actuator Mounting Gasket
95	varies	---	Varies with valve type	Mounting Studs/Screws (Varies)
96	varies	---	Varies with valve type	Mounting Nuts (Not Shown)
97	varies	---	Varies with valve type	Mounting Lock Washer
98	1	007-0141-A-A	007-0141-A-A	Spacing Washer
*	1	055-0104-E-SK	055-0107-E-SK	Seal Kit, Cylinder (All * Items)
**	1	055-0111-E-SK	055-0111-E-SK	Seal Kit, Gear Box (All ** Items)

### Model QT-10 Single Cylinder Actuator

#### Parts List, Actuator Assembly Upgrade

Item	Qty	Part Number	Description
BM	1	Upgrade Ass., QT-10.125	Upgrade Ass., QT-10.140
			Upgrade Assembly, QT-10.1XX
3	4	201-12NCxG8-ZP-HN	201-12NCxG8-ZP-HN
			Hex Nut
5	1	201-12NCxG8-CP-HN	201-12NCxG8-CP-HN
			Nut, Piston Rod Retaining
5a	1	201-12NC-CP-HJN	201-12NC-CP-HJN
			Jam Nut, Piston Rod Retaining
8	4	200-10NCx2.4-BK-HSC	200-10NCx2.4-BK-HSC
			Hex Socket Cap Screw
8a	4	200-10NCx2.4-BK-HSC	200-10NCx2.4-BK-HSC
			Screw, Stop Retaining
**10	2	054-0339-90N-S	054-0339-90N-S
			Torque Arm Seal
8	2	054-0241-90N-S	054-0241-90N-S
			Torque Arm Seal
11	1	007-0015-E-B	007-0015-E-B
			Torque Arm-Not Included (dependent on make & model, may be required if excess worn)
12	2	046-5160.94-BK-ESR	046-5160.94-BK-ESR
			Snap Ring, Heavy Duty
13	2	007-0021-A-B	007-0021-A-B
			Bearing Piece
14	1	007-0005-B-B	007-0005-B-B
			Side Load Bar
16	1	007-0014-B-C	007-0014-B-C
			Side Load Yoke
17	1	030-0193-A-B	030-0193-A-B
			Piston Rod
18	1	030-0118-C-B	030-0118-C-B
			Cylinder Rod End Plate
*19	2	054-0141-70N-S	054-0240-70N-S
			Cylinder End Plate Seal
20	1	030-0192-A-B	030-0192-A-B
			Rod Bushing/Seal Cartridge
*20a	2	053-18701000-P-S	053-18701000-P-S
			Rod Seal
*20b	1	030-0158-A-A	030-0158-A-A
			Packing Washer
*20c	1	057-D.1000-U-S	057-D.1000-U-S
			Wiper
*21	1	054-0229-70N-S	054-0229-70N-S
			Rod Bushing/Seal Cartridge Seal
*22	1	054-0020-70N-S	054-0020-70N-S
			Piston to Rod Seal
23	1	030-0120-C-B	030-0171-C-B
			Piston
*24	2	053-18702125-U-S	053-18703625-U-S
			Piston Seal
*25	1	054-0318-70N-S	054-0318-70N-S
			Piston Stop Seal
34	8	200-7NCx2.4xG9-HCS	200-7NCx2.4xG9-HCS
			Screw, Hex Cap
34a	8	203-7-SS-ESW	203-7-SS-ESW
			Washer, External Star
37	1	200-1.4NFx3.0xG8-CP-HCS	200-1.4NFx3.0xG8-CP-HCS
			Screw, Hex Cap
38	1	201-1.4NF-CD-HJN	201-1.4NF-CD-HJN
			Jam Nut, Valve "Open" Stop Screw
39	1	007-0137-A-B	007-0137-A-B
			Stop Plate
**39a	2	056-0008-A-B	056-0008-A-B
			Stop / Adaptor Gasket
40	2	200-10NCx1.8-BK-HSC	200-10NCx1.8-BK-HSC
			Screw, Side Load Bar
41	4	203-10-CP-HCL	203-10-CP-HCL
			Washer, High Collar Lock
44	2	200-#4NCx12-SS-OPH	200-#4NCx12-SS-OPH
			Screw, "O"-RING Pan Head
45	1	007-0151-A-B	007-0151-A-B
			Torque Arm Cover
**46	1	056-0001-A-C	056-0001-A-C
			Torque Arm Cover Seal
8	1	054-0241-90N-S	054-0241-90N-S
			Torque Arm Cover Seal

## Model QT-10 Single Cylinder Actuator

### Parts List, Actuator Assembly Upgrade (con't)

Item	Qty	Part Number	Description
BM	1	Upgrade Ass., QT-10.125	Upgrade Ass., QT-10.140
			Upgrade Assembly, QT-10.1XX
47	8	200-5NCx1.4-SS-HCS	200-5NCx1.4-SS-HCS
			Screw, Hex Cap
51	2	058-0102-A-B	058-0102-A-B
			Journal Bearing
52	8	203-5-SS-ESW	203-5-SS-ESW
			Star Washer
*60	1	046-5008.137-BK-SR	046-5008.137-BK-SR
			Snap Ring, Inverted
61	1	201-12NC-NP-HLN	201-12NC-NP-HLN
			Flexlock Nut
63	1	007-0136-A-B	007-0136-A-B
			Cyl/Stop Adaptor
63a	1	007-0136-A-B	007-0136-A-B
			Cyl/Stop Adaptor
**68	1	056-0112-A-S	056-0113-A-S
			Cylinder/Adapter Gasket
**69	1	056-0008-A-S	056-0013-A-B
			Cyl/Stop Adapter Gasket
**69a	1	056-0008-A-S	056-0008-A-B
			Cyl/Stop Adapter Gasket
**72	1	056-0007-A-S	056-0007-A-D
			Lid Gasket
80	4	203-10-CP-HCL	203-10-CP-HCL
			Washer, High Collar Lock
98	1	007-0141-A-A	007-0141-A-A
			Spacing Washer (As Required)
*	1	055-0104-E-SK	055-0107-E-SK
			Seal Kit, Cylinder (All * Items)
**	1	055-0111-E-SK	055-0111-E-SK
			Seal Kit, Gear Box (All ** Items)

The above parts are included in the QT-10.1XX Upgrade Assembly. The QT-10 Upgrade Kit allows the end user to field rebuild a QT-10.1XX actuator and bring it up to the latest design series.

## Model QT-10 Single Cylinder Actuator

### Parts List, Actuator Assembly Partial Upgrade

Item	Qty	Part Number	Part Number	Description
		Partial Upgrade	Partial Upgrade	Model
		Ass., QT-10.125	Ass., QT-10.140	Notes
				Starting Serial #
				Bill of Material
5	1	201-12NCxG8-CP	201-12NCxG8-CP	Nut, Piston Rod
or		201-12NC-CP-HJN	201-12NC-CP-HJN	Jam Nut, Piston Rod Retaining
7	2			Bearing Race
**10	2	054-0339-90N-S	054-0339-90N-S	Torque Arm Seal
or	0	054-0241-90N-S	054-0241-90N-S	Torque Arm Seal
11	1	007-0015-E-B	007-0015-E-B	Torque Arm (dependent on valve make & model)
13	2	007-0021-A-B	007-0021-A-B	Bearing Piece
16	1	007-0014-B-C	007-0014-B-C	Side Load Yoke
				piston rod for partial upgrade, QT-10.1
*19	2	054-0141-70N-S	054-0240-70N-S	"O"-Ring, Cylinder End Plate
*20a	2	053-18701000-P-S	053-18701000-P-S	Rod Seal
*21	1	054-0229-70N-S	054-0229-70N-S	Rod Bushing/Seal Cartridge Seal
*22	1	054-0020-70N-S	054-0020-70N-S	Piston to Rod Seal
*24	2	053-18702125-U-S	053-18703625-U-S	Piston Seal
*26	1	054-0318-70N-S	054-0318-70N-S	Piston Stop Seal (Series 2)
27	1			Piston Stop
*46	1	056-0001-A-C	056-0001-A-C	Torque Arm Cover Seal
or	1	054-0241-90N-S	054-0241-90N-S	Torque Arm Cover Seal
47	8	200-5NCx1.4-SS-F	200-5NCx1.4-SS-F	Screw, Lid
48	2			Dowel Pin
49	1			Lid
**51	2	058-0102-A-B	058-0102-A-B	Journal Bearing
61	1	201-12NC-NP-HL	201-12NC-NP-HL	Nut, Flexlock
63	1	007-0136-A-B	007-0138-A-B	Cyl/Stop Adaptor
63a	1	007-0136-A-B	007-0136-A-B	Cyl/Stop Adaptor
or	0			Cyl/Stop Adaptor (QT-15XX.XX)
**72	1	056-0007-A-S	056-0007-A-D	Lid Gasket/Sealer
93a	1			Screw, "O"-RING Pan Head
93b	2			Screw, "O"-RING Pan Head
SK	1	055-0104-E-SK	055-0107-E-SK	Cylinder Seal Kit (Includes * items)
SK	1	055-0111-E-SK	055-0111-E-SK	Actuator Seal Kit (Includes ** items)



## Model QT-10 Single Cylinder Actuator

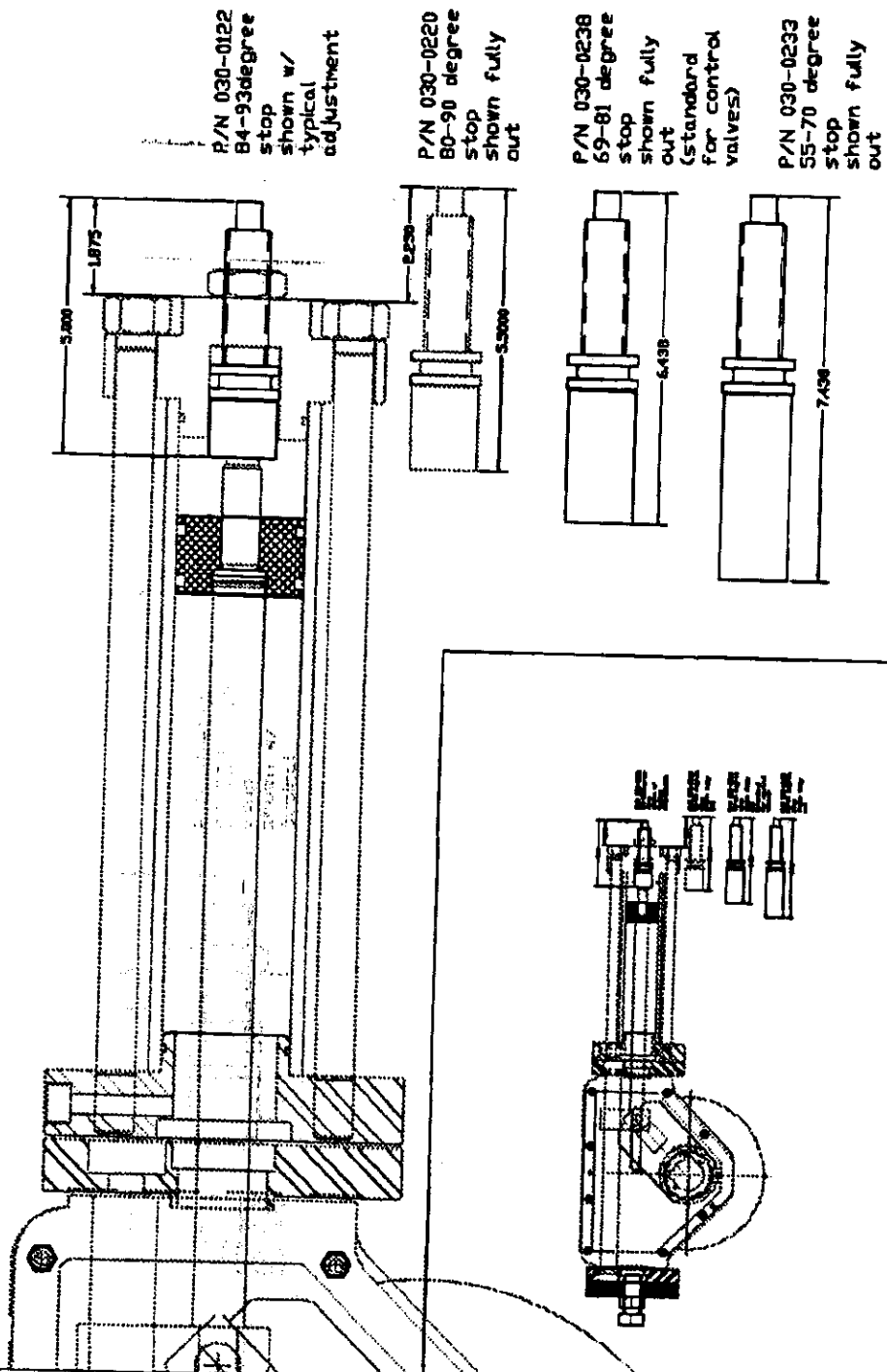
### Parts List, Actuator Assembly Partial Upgrade

Item	Qty	Part Number	Description
BM	1	055-0131-A-SK	Seal Kit, QT-140 Universal Cylinder
19	2	054-0240-70B	Cylinder to endpl. seal (back-up ring for pressures above 1000 psi.)
20a	1	053-18701625-P	Rod seal
or	2	053-18701000-P	
20c	1	057-18701625-U	Rod wiper
or	1	057-18701000-U	
21	1	054-0230-70B	Rod bearing cart. seal (back-up ring for pressures above 1000 psi.)
or	1	054-0229-70B	
22	1	054-0220-70B	Piston to rod seal
or	1	054-0020-70B	
24	2	053-18703625-U	Piston ring seal
or	2	053-25003500-U	Piston ring seal
26	1	054-0322-70B	Piston stop seal
or	1	054-0318-70B	
or	1	054-0220-70B	Piston stop seal
28	1	054-0230-70B	Piston stop housing seal
68	1	056-0113	Cylinder adaptor gasket

NOTES

REV	DESCRIPTION	DATE	BY
TITLE QT-101XX ACTUATOR CLOSE STOP OPTIONS			
DRAWN BY	DATE	CHECK BY	DATE
RLE	07/08/99	VE	07/08/99
PLG SIZE	PLG 1	REVISED	SOLE
B	018-0043	A	1/2

**Thunderco, Inc.**  
 Precision Controls  
 P.O. Box 930755 Houston, Texas 77292  
 PH 0713 681-4686 FAX 0713 681-4688



# Interview Notes

Date:	1/31/02 2/12/02	Location:	via telephone
Accident:	Bellingham Pipeline	Accident Number:	DCA-99-MP-008
Interviewees:	Rick Edrington, Thunderco		
Others in Attendance:			
Notes:	<p>Thunderco purchased globe ball valves, added actuator, and supplied to Olympic.</p> <p>Typically stops are present in all, but only set if needed. Normally set so that won't pump against a closed valve.</p> <p>Got flooded last summer, so lost paperwork on project. Has talked to Jacobs.</p> <p>Stops are field adjustable. Don't have to remove from service to adjust.</p> <p>Can't tell by looking at it where stops are set. Must watch valve travel to find limits.</p> <p>Typically 600# valves would be on outlet side.</p> <p>Control valves will invariably leak through because of the constant modulation.</p> <p>Valves close clockwise. Adjust stops (#33 on schematic). #37 is adjustment side.</p> <p>#11 slips onto valve.</p> <p>Typically valves are tuned to hold a pressure within 2-3 psi of set point.</p> <p>Hydraulics interface with PLC. Tuning proportional band in the PLC.</p>		
Prepared by:	Allan Beshore, IIC		