OPERATOR'S MANUAL

850-SERIES ACTUATORS

January 1985

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OPERATOR'S INSTRUCTION MANUAL

January 1985

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WARNING

DO NOT ATTEMPT TO ADJUST THE ACTUATOR IN ANY WAY. ANY ATTEMPT TO REMOVE THE CASE SCREWS WILL CAUSE A MALADJUSTMENT IN THE ACTUATOR. CALL THE FACTORY BEFORE YOU TRY TO ADJUST, REPAIR, OR ALTER ANY OF THE 850-SERIES ACTUATORS, MODULES, OR CONTROLLERS WITHOUT FACTORY-PROVIDED INSTRUCTIONS. ANY UNAUTHORIZED ATTEMPTS TO ADJUST, REPAIR, OR ALTER THE ACTUATORS OR CONTROLLERS WILL INVALIDATE YOUR WARRANTY.

1.0 INTRODUCTION

The 850-Series Linear Actuator provides precise, variable speed, linear motion. The actuators are driven by a fractional-horsepower DC servo motor with an integral position encoder. The 850 is offered in two motor sizes, each with a multitude of gear reduction ratios. Its velocity servo electronics, an integral part of the actuator package, assure that changing load conditions will not affect velocity, cause motor burnout, or shape the encoder signal. In addition, the servo electronics sense motor stalls and end-of-limits to prevent mechanical binding.

The position information from each actuator comes from a built-in optical encoder. In the standard configuration (32.3346 TPI, 262:1 gearhead, and 1616 motor), the lead screw pitch, gearhead ratio, and number of encoder pulses per revolution have been selected to make each encoder count equivalent to 0.100 micron of linear travel.

The following is a list of products compatible with the 850-Series family of actuators:

850C COMPUTER SYSTEM

855 (4-AXIS) PROGRAMMABLE CONTROLLER

850I-5/10/15 CABLES

850-05 ACTUATOR: 1/2" TRAVEL
850-1 ACTUATOR: 1" TRAVEL
850-2 ACTUATOR: 2" TRAVEL
850-4 ACTUATOR: 4" TRAVEL
850-6 ACTUATOR: 6" TRAVEL

2.0 EQUIPMENT SET-UP

2.1 UNPACKING

The actuators are shipped in sturdy, foam-cushioned boxes. The 850SER Servo is part of the actuator. Please inspect the actuators and/or controllers immediately and notify the carrier if damage is obvious. Consider saving the shipping boxes in case anything needs to be shipped back to the factory.

2.2 MECHANICAL SPECIFICATIONS

850-05 ACTUATOR
Body Length: 6.8"
Body Diameter: 1.0"
Weight: 0.6 lbs.
Body Material: Aluminum
Standard Temperature Range: 0°C to 65°C

850-1 ACTUATOR
Body Length: 7.6"
Body Diameter: 1.0"
Weight: 0.7 lbs.
Body Material: Aluminum
Standard Temperature Range: 0°C to 65°C

850-2 ACTUATOR
Body Length: 9.6"
Body Diameter: 1.0"
Weight: 0.9 lbs.
Body Material: Aluminum
Standard Temperature Range: 0°C to 65°C

850-4 ACTUATOR
Body Length: 14.6"
Body Diameter: 1.0"
Weight: 1.5 lbs.
Body Material: Aluminum
Standard Temperature Range: 0°C to 65°C

850-6 ACTUATOR
Body Length: 19.0"
Body Diameter: 1.249"
Weight: 3.1 lbs.
Body Material: Aluminum
Standard Temperature Range: 0°C to 65°C

850SER SERVO
Maximum Case Dimensions (Height x Width x Length): 1.6" x 2.6" x 4.8"
Case Material: High impact polystyrene
Base Color: Dark gray Cover Color: Light gray
Maximum Working Temperature: 65°C

NOTE: All figures are approximate. See Appendix D for actuator dimensions. Actuators may also be ordered with a temperature range of -40°C to +85°C.

2.3 ACTUATOR MOUNTING

There are basically four ways to mount an actuator in a mechanical device:

1) Unscrew the retaining nut and insert into the mount. Either use a spanner wrench to tighten the nut or gently rotate the actuator body while holding the nut stationary with the fingers or a small screwdriver to tighten the whole assembly.

2) The actuator is mounted another way when the mount has a setscrew. The retaining nut is not used. Just insert the actuator and tighten the setscrew.

3) When neither of the above two mounting methods can be used, the customer's own ingenuity comes into play. It might be necessary to partially disassemble the device the actuator is being used in. When access to the retaining nut side is reached, simply follow method #1 above.

4) For panel mounting in panels up to 1/2" thick, drill a 3/8" hole. Insert actuator and tighten retaining nut.

NRC EQUIPMENT WHERE ACTUATORS REPLACE MICROMETERS

EQUIPMENT	SERIES
Translation stages	400, 405, 420, 425, 430, 435, 440
Rotational stages	470, 480
Micropositioning stages	460
Tilt platforms	36, 37
Optical mounts	600
Mirror mounts	610, 620, 625, 630, 640, 675
Lens positioners	700, 705, 740, 760
Spatial filter	900

Some specific directions for mounting the 850-Series actuators to Newport Corporation equipment follow:

2.3.1 USING WITH 420-SERIES TRANSLATION STAGES

When using the 420-Series Translation Stages, remove existing retaining nut and micrometer. Insert actuator. Install new retaining nut. While holding nut with finger, rotate actuator body until assembly is tight.

CAUTION: Model 850-2, 850-4 and 850-6 actuators should not be positioned where outside forces can accidently apply damaging leverage.

When the 850-2, 850-4 and 850-6 actuators are used on 420-Series Translation Stages, an actuator mounting problem can exist because of the unsupported length of the actuators. The large mechanical leverage created by this unsupported length can allow a relatively small force on the tube end to strip the dovetail mounting block from the stage.

2.3.2 USING WITH 400-SERIES TRANSLATION STAGES

To use 850-05 actuators with the 400-Series Translation Stages, the stage itself must be disassembled to access the micrometer-holding bearing block. Since reassembly may not be as precise as factory assembly, be careful not to disassemble the stage any more than necessary to install the actuators.

2.3.3 USING WITH 470-SERIES ROTATIONAL STAGE

When adapting to the 470-Series Rotational Stage, the retaining nut is not used. Unscrew the setscrew on the side; remove the existing micrometer; insert the 850-05 actuator and tighten the setscrew again.

NOTE: The 850-05 actuator is specifically designed to mount to the 470-Series Rotational Stages.

2.3.4 USING WITH 625-SERIES MIRROR MOUNTS

To adapt to 625-Series Mirror Mounts, carefully pry mirror mount plates apart with a large screwdriver and remove existing retaining nut with spanner wrench or small screwdriver. Remove existing micrometer. Insert 850-05 actuator; install new retaining nut; gently rotate body of actuator while holding the nut from rotating with your finger or a small screwdriver until body is tight and well seated.

NOTE: The 850-05 actuator is specifically designed to mount to the 625-Series Mirror mounts.

3.0 850-SERIES ACTUATOR

The 850-Series of actuators are essentially identical except for length of travel. Except for the 850-4 and 850-6, the 850 actuators' 1-inch (outside diameter) bodies have been relieved to accomodate NRC #625 Mirror Mounts and other components.

Model	Travel	Body Package Length from Mounting Surface	Body Diameter
850-05	0.5"	6.8"	0.998"
850-1	1.0"	7.6"	0.998"
850-2	2.0"	9.6"	0.998"
850-4	4.0"	14.6"	0.998"
850-6	6.0"	19.0"	1.249"

To provide accurate motion, the actuator's 3/16 inch plunger is non-rotating and relies on outside spring pressure to return the plunger into the actuator's body. The standard actuator can produce a maximum thrust of 30 pounds; but, when operating smoothly within the velocity servo window, the maximum thrust is approximately 25 pounds.

The actuator's internal structure is a precision-ground leadscrew with a pitch of 32.3346 TPI. Its best absolute cyclic pitch error as measured with an H/P Interferometer is approximately + or - 0.5 microns. For this very fine accuracy, the actuators have to be special ordered--the standard order may have a greater pitch error. The leadscrew is supported by two bearings spaced approximately one inch apart for a long "Length/Diameter" precision shaft support. A non-rotating brass nut rides the leadscrew and pushes the plunger. The ends of travel are cushioned to provide a slow deceleration and reduce the chance of binding at the ends.

These units are powered by a low inertia DC motor to provide smooth movement with low acoustic and mechanical noise. Submicron resolution is obtained with a precision ground and electropolished stainless steel leadscrew driven through a low backlash reduction gear.

The leadscrew is driven by a DC-motor/gearhead combination. The motor has an ironless-rotor to permit fast response due to its low inertia. The brushes are precious-metal plated for long life. The factory lube has a vapor pressure of 10^{-6} torr at 25°C. For lower vacuum environments, the gearhead is cleaned and relubed to 10^{-9} torr at 39°C.

3.1 ENCODER DECODING

The encoder outputs two phases of information. Each phase is a square wave shifted 90-degrees from the other. One phase either leads or lags the other depending on the direction of travel. Typically, you can use one phase for position information and check the level of the other at the transition to determine direction. For 30 counts per revolution, you must use both up and down signal transitions of one phase for counting since there are only 15 pulses per revolution.

3.2 850SER SERVO

The velocity servo is a bridge-balance type of control circuit. In detail, the motor's coil is one impedance in a four-impedance bridge. At rest, the bridge is balanced. Since the coil's effective resistance is a function of the motor's velocity, a convenient error signal can be generated by the bridge imbalance.

The bridge is driven by a power amplifier operating open-loop. The non-inverting input is the Command Velocity in the range of ±10 vdc. The inverting input is the amplified error signal from the bridge. Initially, when the motor is at rest, the error is zero. A finite Command Velocity will cause the power amplifier to kick on fully since it is operating as a comparator. As the motor approaches the commanded velocity, the error signal rises to match the command velocity and the power driver's output approaches zero. However, as the motor subsequently begins to slow down, the amplifier's output again rises to increase the velocity. Thus, the servo regulates the motor's velocity within a load window approaching 30 pounds.

The bridge balance is adjusted at the factory to produce a "critically balanced" response to a pulse. However, you may wish to modify the balance for reasons of your own. If so, please refer to Appendix B.

3.3 MOTOR SIZE AND GEARHEAD RATIO OPTIONS

The two motors available in the 850-Series actuators are the -1616 and the -1624. The -1624 is four times more powerful than the -1616 and will push a heavier load.

There are 13 different gearhead ratios available for the 850-Series actuators, ranging from a ratio of 6.3:1 to 10683:1. The complete list of gearhead ratio options is as follows.

NOMINAL	ACTUAL
6.3:1	6.3968254
11.8:1	11.8641975
22:1	22.0335093
41:1	40.8655693
76:1	75.8932002
141:1	140.7591830
262:1	261.4099120
485:1	484.8371880
900:1	900.4119200
1670:1	1669.9947600
3101:1	3101.4188400
5752:1	5752.2041700
10683:1	10682.6648300

There are three primary considerations when choosing a gearhead--speed, load capacity, and resolution. The higher gearhead ratios have a low speed, high load capacity and high resolution. The lower gearhead ratios have a high speed, low load capacity and low resolution. For more exact information examine the Load/Speed chart in Section 3.5.

3.4 ACTUATORS WITH HIGH-RATIO GEARHEADS

Actuators with gearhead ratios greater than 485:1 necessitate special handling by the user. These gearheads generate unusually high thrusts that may damage the gearhead/motor if the actuators are allowed to run into their limits of travel at speeds greater than 50% of full scale. Our method of limit indication is to sense that the motor is producing high thrust but at velocity lower than commanded. This indicates operation outside of the designed velocity servo window. Both limits have elastomer cushions to absorb the mechanical shock and momentum. However, for high gearhead ratios, the motor's momentum appears to be extremely high when moving at full speed and the cushions are not sufficient.

To help protect the gearhead/motor, the normal velocity servo electronics has been modified to limit the current into the motor so that the actuator can produce no more than 100 pounds, even with the highest gearhead ratio. This limitation serves to prohibit the actuators from simultaneously exerting maximum thrust and maximum velocity (maximum momentum). This current limit attempts to protect the gearhead from damage if it runs into the limit of travel at maximum speed. See table in Section 3.5.

3.5 850-SERIES ACTUATOR LOAD/SPEED CHART (32.3346 TPI)

MODEL (Gear-head)	RESOLUTION		VELOCITY						LOAD	
			JOG MODE		SLEW MODE				-16	-24
					-16 (Motor)		-24 (Motor)			
			MIN	MAX	MIN	MAX	MIN	MAX		
	um	uin	um/sec	um/sec	mm/sec	mm/sec	mm/sec	mm/sec	lbs	lbs
-6.3	4.1	160	26	104	NA	NA	1.5	15	NA	4
-11.8	2.2	87	14	56	NA	NA	0.81	8.1	NA	8
-22	1.1	47	7.6	30	0.6	6	0.43	4.3	3	13
-41	0.64	25	4.0	16	0.3	3	0.23	2.3	5	25
-76	0.35	14	2.2	8.8	0.2	2	0.13	1.3	9	42
-141	0.190	7.3	1.1	4.4	0.1	1.0	0.067	0.67	18	77
-262	0.100	3.9	0.64	2.5	0.05	0.5	0.037	0.37	30	100*
-485	0.054	2.0	0.35	1.4	0.03	0.3	0.020	0.20	56	100*
-900	0.029	1.1	0.19	0.76	0.014	0.14	0.011	0.11	91	100*
-1670	0.016	0.63	0.10	0.40	0.008	0.08	0.0057	0.057	100*	100*
-3101	0.0084	0.32	0.054	0.22	0.004	0.04	0.0031	0.031	100*	100*
-5752	0.0046	0.200	0.029	0.11	0.002	0.02	0.0017	0.017	100*	100*
-10683	0.0025	0.079	0.016	0.06	0.001	0.01	0.0009	0.009	100*	100*

NA = Series Unit NOT AVAILABLE
* = Load carrying capacity limited to 100 lbs. to protect the gearhead.
um = Micron: uin = Microinch

3.6 INTERCONNECT CABLES - 850I-5/850I-10/850-15/850I-?

The Interconnect Cables are general purpose cables used for interconnecting all external modules--Power Supply, Actuator(s), and Remote. There are no differences in the cables except for their length. However, the actuator's performance is influenced by the length of its interconnecting cable. Since the actuators are set-up for 10-ft. cables at the factory, you may experience some irregular servo performance if you attempt to use a cable longer than 20-feet. If requested at time of order, the actuator can be set-up to function at any cable length up to 500 feet. The 850I cables may also be special ordered "noise-free"--shielded for EMI protection.

3.7 VACUUM COMPATIBILITY

The 850-Series actuators can be ordered to operate cleanly within a vacuum environment. The following describes the alterations that make the standard actuators vacuum compatible.

The high vacuum model of the 850-Series Linear Actuator comes with the following features:

1. 24-inch teflon-coated cable from actuator to servo - can be cut for vacuum feedthru.
2. Unanodized aluminum body without label.
3. No fastener sealing compound.
4. Unanodized metal end cap.
5. Special lubricant with vapor pressure of 10^{-9} torr at 39°C.
6. Vented motor/gearhead/encoder cavities

The above features compensate for or replace the following vacuum incompatible features in the standard 850 Actuator:

1. Ribbon cable with PVC outer jacket and poyethylene-coated wires.
2. Anodized aluminum body with adhesive label.
3. External fastener sealing compound.
4. Molded plastic end cap.
5. Standard lubricant with vapor pressure of 10^{-6} torr at 25°c.
6. No vented motor/gearhead/encoder cavities

4.0 HARDWARE PIN ASSIGNMENTS

SERVO

PIN#	NAME	ACTION	COMMENTS
1	V+	Positive Supply	+15 VDC @ 175 mA
2	AGND	Analog Ground	
3	V-	Negative Supply	-10 to -15 VDC @ 174 mA
4	CMVEL	Command Velocity	+10.00 VDC = maximum FORWARD + .50 VDC = minimum FORWARD -10.00 VDC = maximum REVERSE - .50 VDC = minimum REVERSE (When connected to 850S Speed Controller, the minimum voltage is +/- 1.00 VDC.) Input current = 20 uamps
5	PH1	Encoder Phase #1	High = Positive Supply Voltage Low = -.3 VDC
6	PH2	Encoder Phase #2	Same as Phase #1 90° phase angle difference
7	AGND	Analog Ground	
8	FARL	FORWARD LIMIT (FAR LIMIT)	Open Collector Active low R_{pu} = 4.7K for TTL or CMOS
9	NEARL	REVERSE LIMIT	Same for FARL

NOTE: Balance the + and - supplies within 100mV.

use -15V Adj pot in controller
(6 top screws + 4 allen screws to remove top cover)

APPENDIX A

PHYSICAL PIN LOCATIONS

1.0 9-PIN SUBMINIATURE "D"

This connector-pair is used to connect the 850SER SERVOs to the Mainframe. It is also used on the INTERCONNECT CABLE.

1.1 LOOKING DIRECTLY AT THE PINS OF THE ANSLEY 609-9P CONNECTOR:

Upper Left Hand Corner

```
1   3   5   7   9
  2   4   6   8
```

Lower Right Hand Corner

1.2 LOOKING DIRECTLY AT THE SOCKETS OF THE ANSLEY 609-9S CONNECTOR:

Upper Left Hand Corner

```
9   7   5   3   1
  8   6   4   2
```

Lower Right Hand Corner

NOTE: This is **not** the usual CANNON standard but the "ribbon cable" standard.

APPENDIX B

ADJUSTING THE 850 ACTUATOR'S SERVO ELECTRONICS

1.0 INTRODUCTION

The servo electronics for the 850-series actuators uses a balanced-bridge velocity servo. While this type of velocity servo control is fast responding and produces smooth motor motion, it can be misaligned.

1.1 SYMPTOMS OF MALADJUSTMENT

1. Actuator moves slowly on its own.
2. Either or both limits do not function.
3. Thrust is below standard.

Therefore, if any of these symptoms exists, we suggest you adjust both (1) the Bridge Balance and (2) the Zero setting of your servo. To make the adjustment, you'll need the following:

1.2 SUGGESTED TOOLS

1. Blade screwdriver with medium to small blade.
2. Battery-powered or isolated digital volt meter.
3. Blade screwdriver with small blade for trim POTs.
4. Oscilloscope.

2.0 ALIGNMENT PROCEDURE

STEP	ACTION
1	Open the servo box on the actuator cable. Position the box in front of you with the actuator on your left. Remove all loads from the actuator.
2	Referring to Component Placement Drawing #1, locate the row of four testpoints (TP3, 4, 5, 6).
3	Attach the positive voltmeter lead to TP5. TP5 is the third pin away from the ribbon connector. Attach the ground lead to TP3. TP3 is the pin nearest to the ribbon connector.
4	Locate the POT (R19) to the left of the 8-pin OP-05 (U3). Using the small blade screwdriver, pry off the screw-sealing compound.

ZERO SETTING

5	With the DVM in the 200 mV DC range, adjust POT (R19) until the reading is within 50 mV of zero. The closer the better.

BALANCE SETTING

6	Locate the POT (R12) between the 8-pin OP-05 (U3) and the 4-pin UA759 (U2). Using the small blade screwdriver, pry off the screw-sealing compound.
7	Attach the scope to the same test points as the DVM is using. Set the sweep to 5 mS per division and the gain to 5 volts per division for a 1X probe or .5 volts per division for 10X probe. Set the mode to NORMAL trigger at POSITIVE slope.

------>> If your system has a JOG

8	Hold the JOG switch in FORWARD and the velocity-control knob to maximum and observe the waveform. The JOG delivers a constant width pulse at about 6 pps. The pulse's height is controlled by the velocity-control knob. The servo's correct response to the JOG pulse is to rise rapidly to approximately 15 volts (Op-Amp [+SAT]) and stay there for 4 to 7 mS. Then the voltage falls through zero to about -15 volts (OP-AMP [-SAT]) for about 3 to 5 mS and smoothly returns to zero volts without going above ground as a critically damped waveform. Drawing #2 depicts the correct waveform.

STEP	ACTION
------>>	Incorrect waveform #1 (Under-damped)
	In the underdamped condition, the waveform will not fall to -15 volts for a time period but either doesn't fall much below ground or doesn't have a flat on it's bottom.
	In the extreme of this condition, the actuator will not produce much thrust and the limits may not function.
------>>	Incorrect waveform #2 (Over-damped)
	In the overdamped condition, the waveform may be oscillating or over-shoot when returning from its excursion below ground.
	In this condition, the actuator will vibrate or drift in position.
9	Adjust the POT (R12) to approximate the critically-damped waveform.
------>>	If your system doesn't have a JOG
8	Set the velocity control knob to minimum. Turn-on actuator to FORWARD direction and observe the waveform.
	At this slow velocity, the waveform will be a series of almost randomly occurring spikes. The fall from the spike peak should go slightly below ground and smoothly return to ground.
------>>	Incorrect waveform #1 (Under-damped)
	The waveform has rounded positive spikes or no-spikes at all.
------>>	Incorrect waveform #2 (Over-damped)
	The waveform is oscillating or overshoots when returning from below ground.
10	Return to STEP 5 and repeat as many times as required to get both the ZERO and the BALANCE correct.
11	Close-up the servo box being careful not to let the cable strain-relief ties rest on the stand-up resistors.

I had more luck adj- zero w servo motor off (disconnect ribbon) then adjusting ~~dap~~ damper on ckt just by listening to actuator (plug servo back in) so it is silent at rest but moves @ full speed w/ jog. design of system is really crappy.

-RCR '97

3.0 HELPFUL HINTS

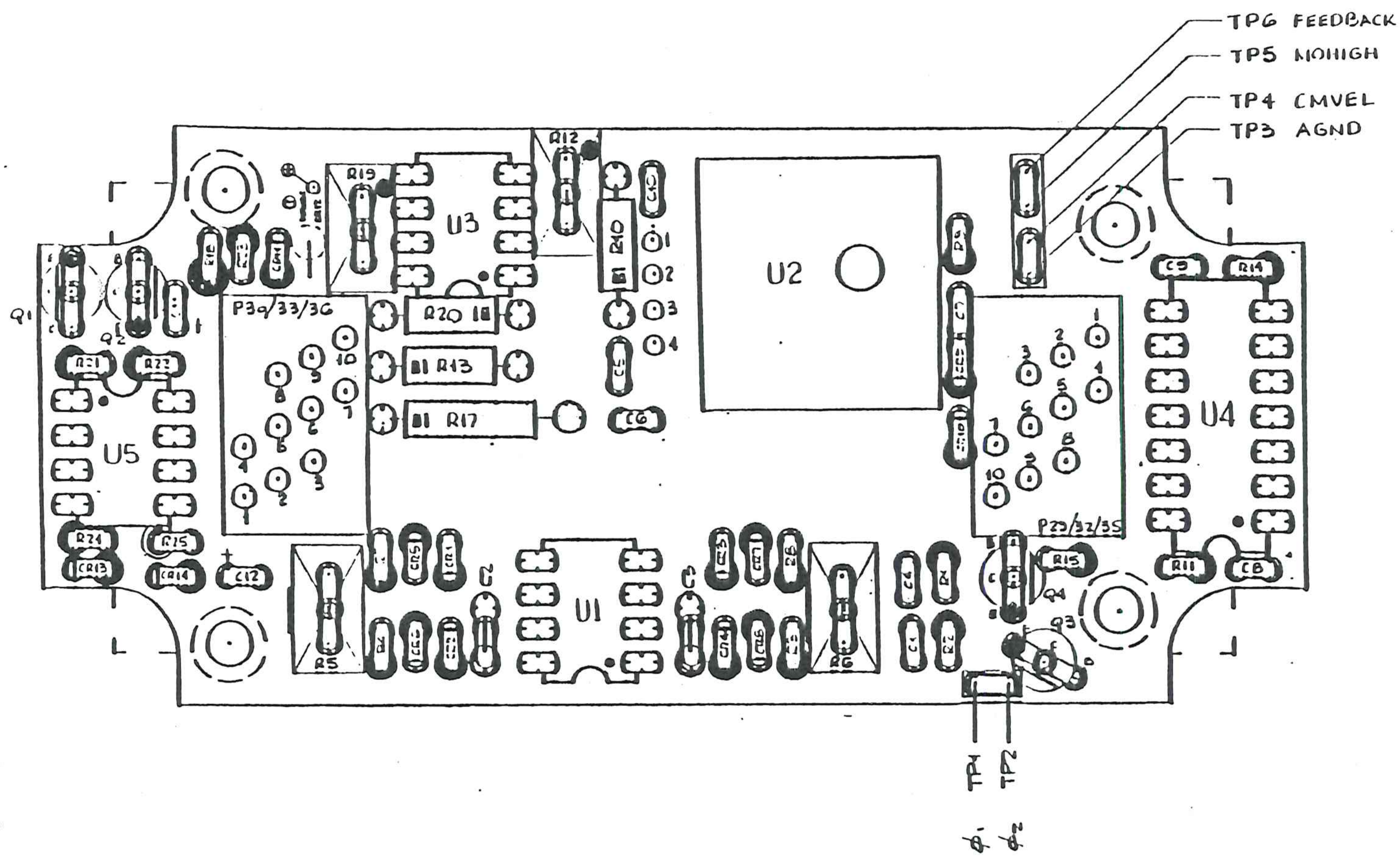
1. The scope test leads may cause a level shift through a ground loop. Don't set the zero with the scope attached. Use the scope only for setting the shape. Use a battery-powered DVM or isolated DVM to set the zero.

2. During the life of the product, component aging may cause the settings to drift. We suggest checking and adjusting every 3 months.

3. The balance influences the zero setting. The last thing to adjust must be the zero.

4. Often adjusting the zero is sufficient to correct servo performance. Adjusting the balance is quite difficult and should be avoided unless necessary.

ZONE	LTR	REVISIONS DESCRIPTION	DATE	APPROVED
		REV. G	7/8/81	



DRAWING #1

QTY REQD	CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION

PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE:
FRACTIONS ± DECIMALS .XX ± .XXX ± ANGLES ±

MATERIAL

FINISH

DO NOT SCALE DRAWING

NEXT ASSY	USED ON
APPLICATION	

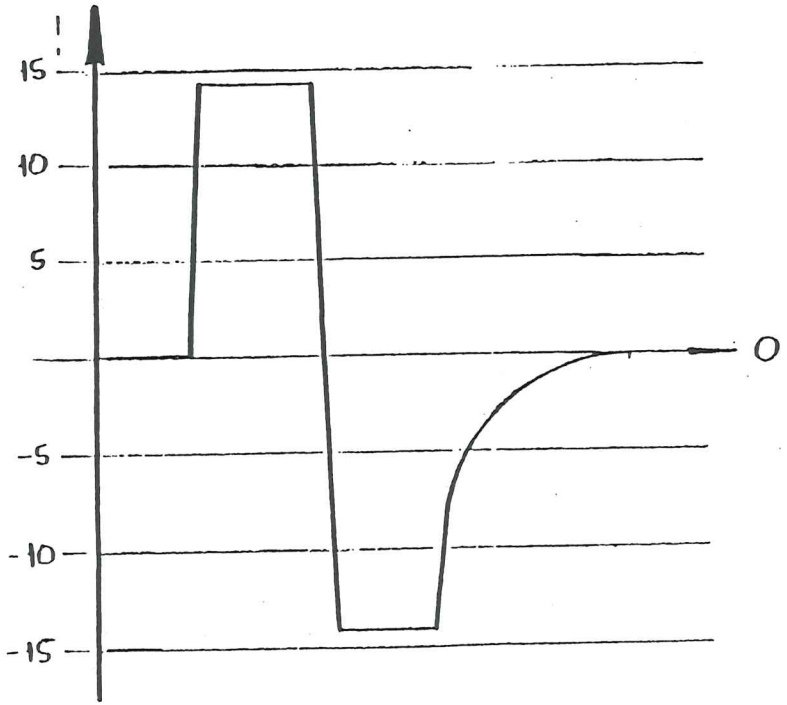
CONTRACT NO

APPROVALS	DATE
DRAWN J. Thomasson	10/28/80
CHECKED	

ACTUATOR PREPROCESSOR & SERVO-DRIVE
COMPONENT PLACEMENT 1632413 R-G

SIZE C | CODE IDENT NO | DRAWING NO

SCALE | SHEET OF



CORRECT WAVEFORM

DRAWING # 2

ROBERT ROCCI
626-795-7485
626-795-7987

001
NEWPORT-KLINGER
07/11/97 13:30 FAX 714 253 1841

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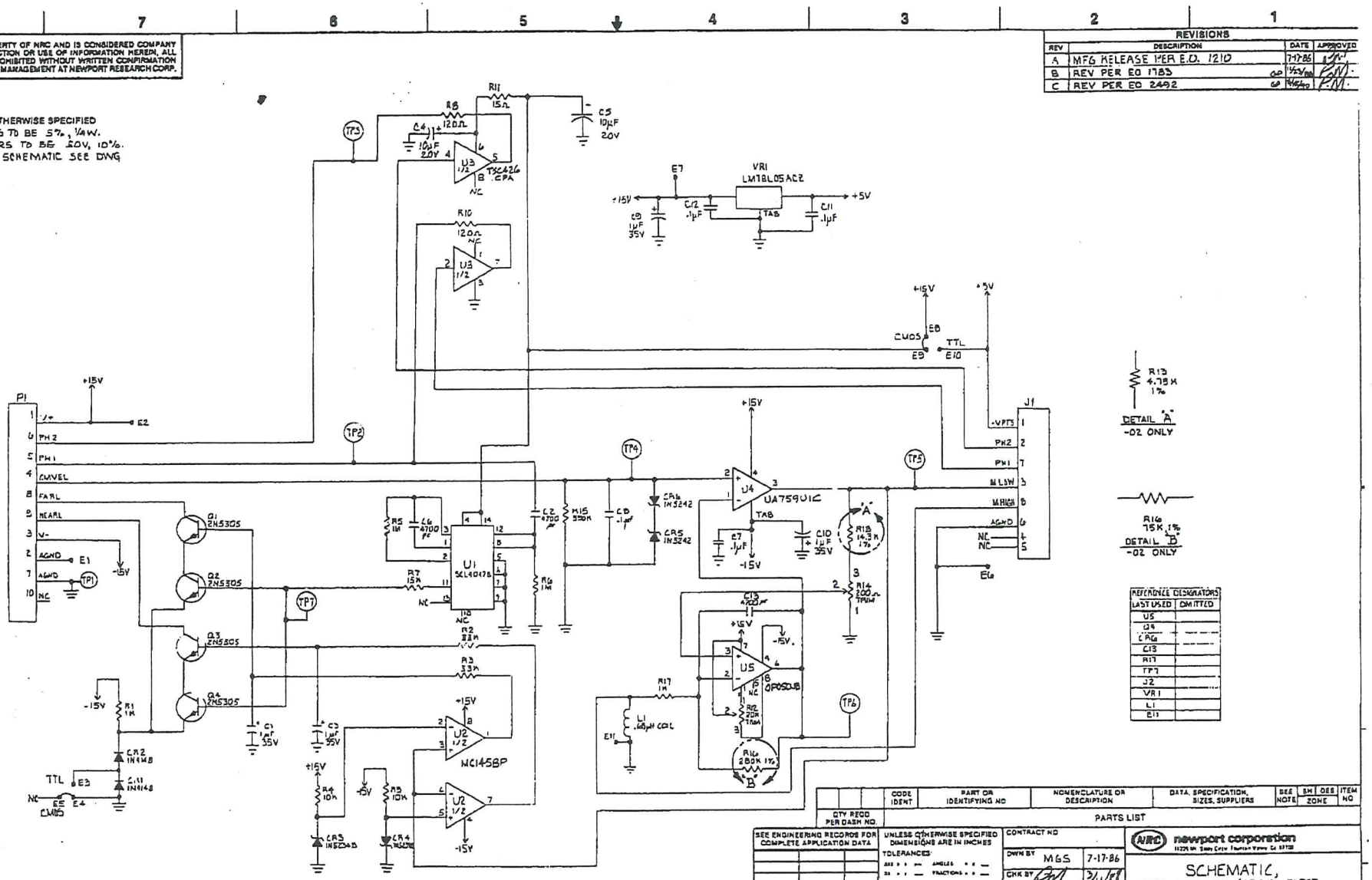
REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	MFG RELEASE PER E.O. 1210	7-17-86	
B	REV PER EO 1783	1/22/88	
C	REV PER EO 2492	4/6/88	

NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL RESISTORS TO BE 5%, ¼W.
2. ALL CAPACITORS TO BE 20V, 10%.
3. FOR SYSTEM SCHEMATIC SEE DWG 15465.



REFERENCE DESIGNATORS	
LAST USED	OMITTED
U5	
Q4	
CR6	
C13	
R17	
TP7	
J2	
VR1	
L1	
E11	

PARTS LIST

QTY REQD PER DASH NO.	CODE IDENT	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION	DATA, SPECIFICATION, SIZES, SUPPLIERS	SEE NOTE	SM ZONE	QES	ITEM NO

SEE ENGINEERING RECORDS FOR COMPLETE APPLICATION DATA

NEXT ASSY	TOP ASSY	MOD NO.
14267	16289	
14267	13516	
14267	13516	850 Series

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES
.XX ± .01 ANGLES ± 0°
.XX ± .005 FRACTIONS ± 1/64
SURFACE FINISH 63 OR BETTER
INTERPRET DIMENSIONING IN ACCORDANCE WITH ANSI Y14.5-1973
MATERIAL

CONTRACT NO
DWN BY MGS 7-17-86
CHK BY [signature] 7/1/86
RESP ENGR [signature] 7/1/86
DESIGN ACTIVITY APPROVAL [signature]

NRC newport corporation
SCHEMATIC, 850 ACTUATOR/SERVO ELECT.
SIZE D | CODE IDENT NO. | DWG NO. 14269 | REV C
SCALE | WT | SHEET 1 OF 1

ROBERT ROCCI
626-795-7485
626-795-7487

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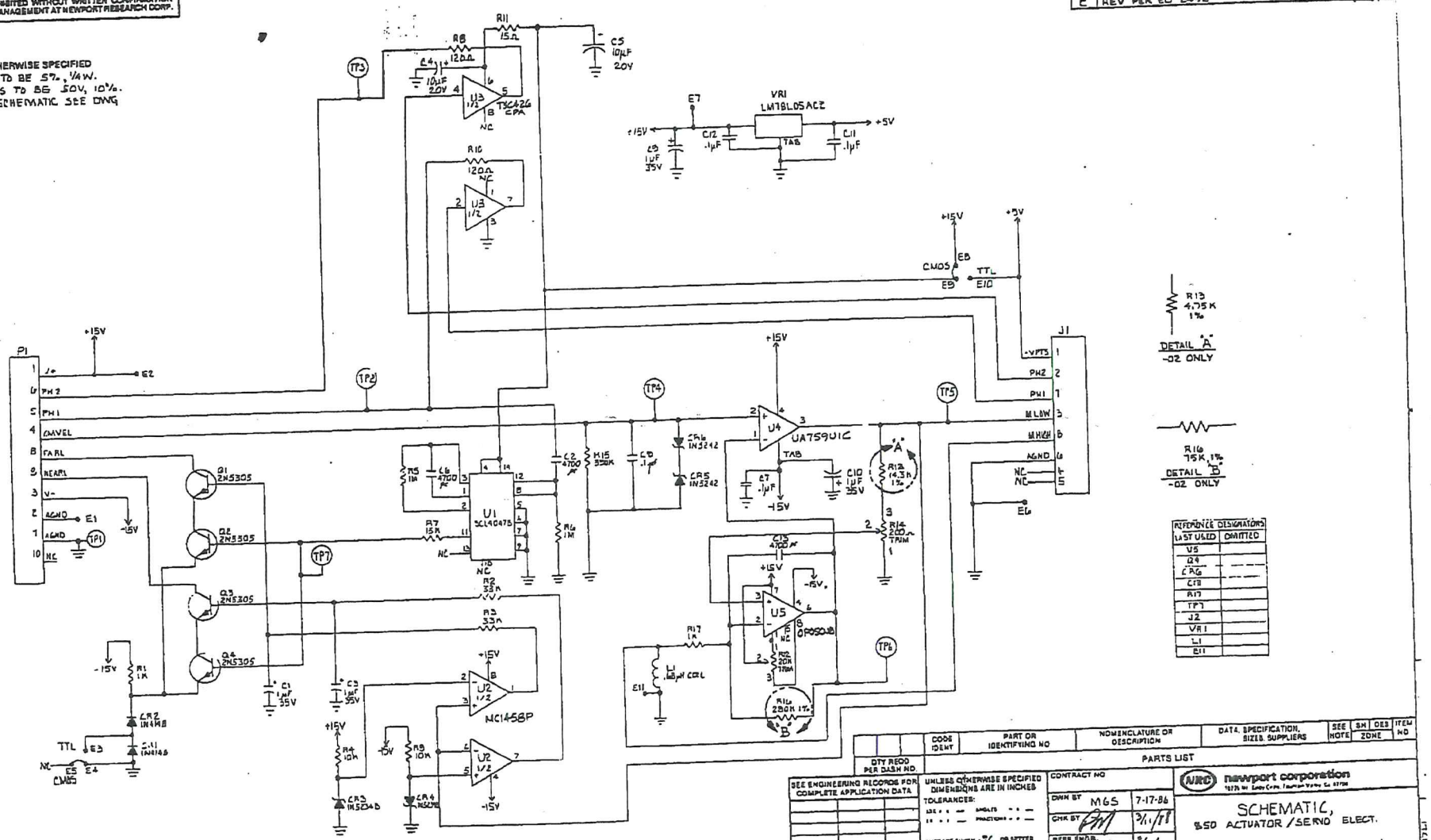
NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL RESISTORS TO BE 5%, 1/4W.
2. ALL CAPACITORS TO BE 50V, 10%.
3 FOR SYSTEM SCHEMATIC SEE DWG 15469.

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	MFG RELEASE PER E.O. 1210	7-17-86	MGS
B	REV PER EO 1783	12-5-88	PM
C	REV PER EO 2492	3-14-89	PM



REFERENCE DESIGNATORS	
LAST USED	OMITTED
U5	
Q4	
CR6	
C18	
R17	
TP7	
J2	
VR1	
L1	
E11	

QTY REQD PER DASH NO.	CODE IDENT	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION	DATA, SPECIFICATION, SIZES, SUPPLIERS	SEE NOTE	SH	DES ZONE	ITEM NO
			PARTS LIST					

SEE ENGINEERING RECORDS FOR COMPLETE APPLICATION DATA

14247	16289	
14247	13516	
14266	13511	
NEXT ASSY	TOP ASSY	MOD NO.

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES:
MATERIAL

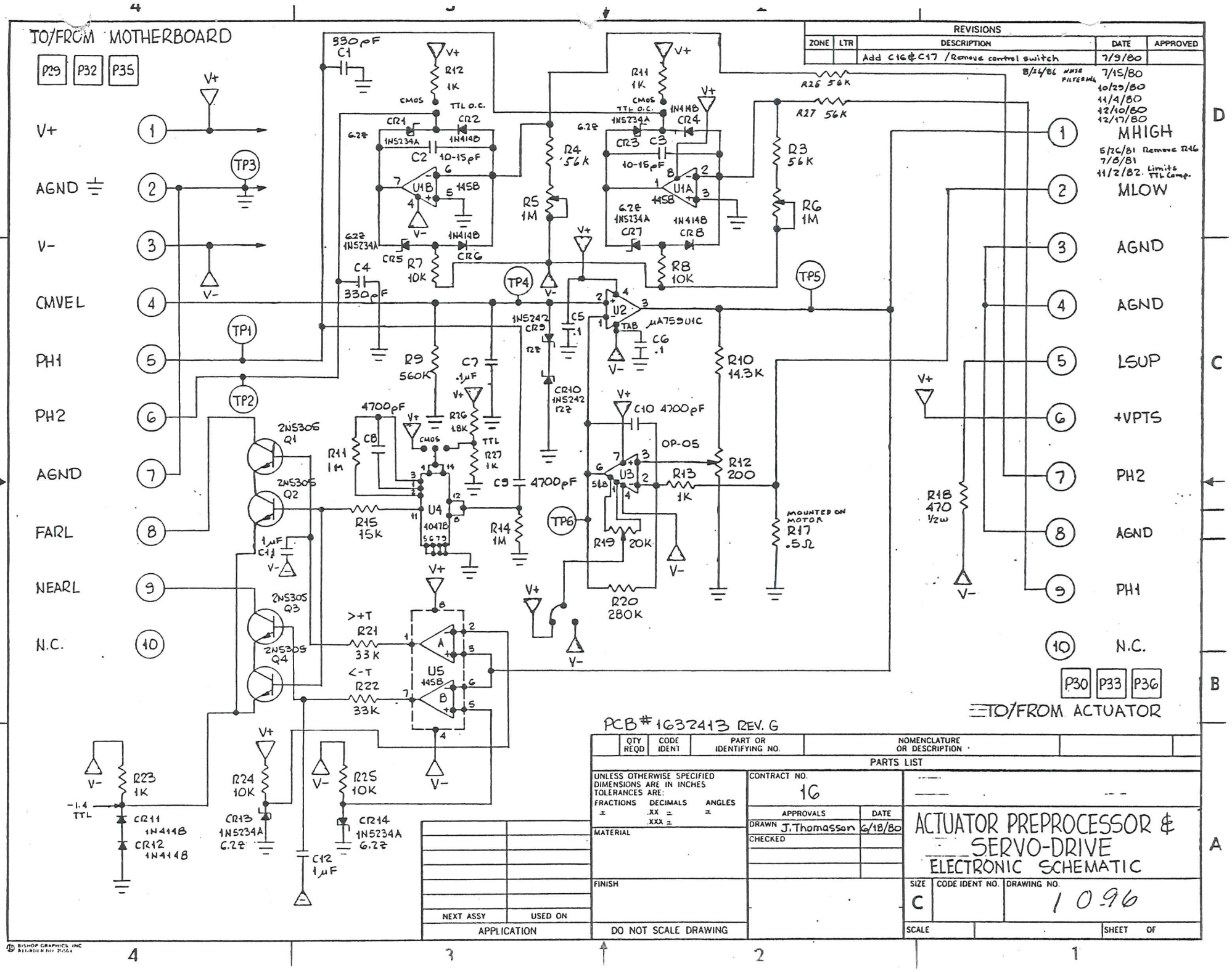
CONTRACT NO
DWN BY MGS 7-17-86
CHK BY PM 3/11/89
ENGR. E. Blaine 3/14/89
DESIGN ACTIVITY APPROVAL

NRC newport corporation
SCHEMATIC, SSD ACTUATOR/SERVO ELECT.

SIZE	CODE IDENT NO.	DWG NO.	REV
D		14269	C

SCALE — WT — SHEET 1 OF 1

07/11/97 13:32 FAX 714 253 1841 NEWPORT-KLINGER 001



REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
		Add C16&C17 /Remove control switch	7/9/80	
		B/24/86 NOISE FILTERING	7/15/80	
			10/29/80	
			11/4/80	
			12/10/80	
			12/17/80	
			5/12/81 Remove R16	
			7/8/81	
			11/2/82 Limits TTL Comp.	

PCB# 1632413 REV. G

QTY REQD	CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION

PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS ± DECIMALS .XX ± .XXX ± ANGLES ±

MATERIAL

FINISH

DO NOT SCALE DRAWING

CONTRACT NO. 16

APPROVALS	DATE
DRAWN J.Thomasson	6/18/80
CHECKED	

ACTUATOR PREPROCESSOR & SERVO-DRIVE ELECTRONIC SCHEMATIC

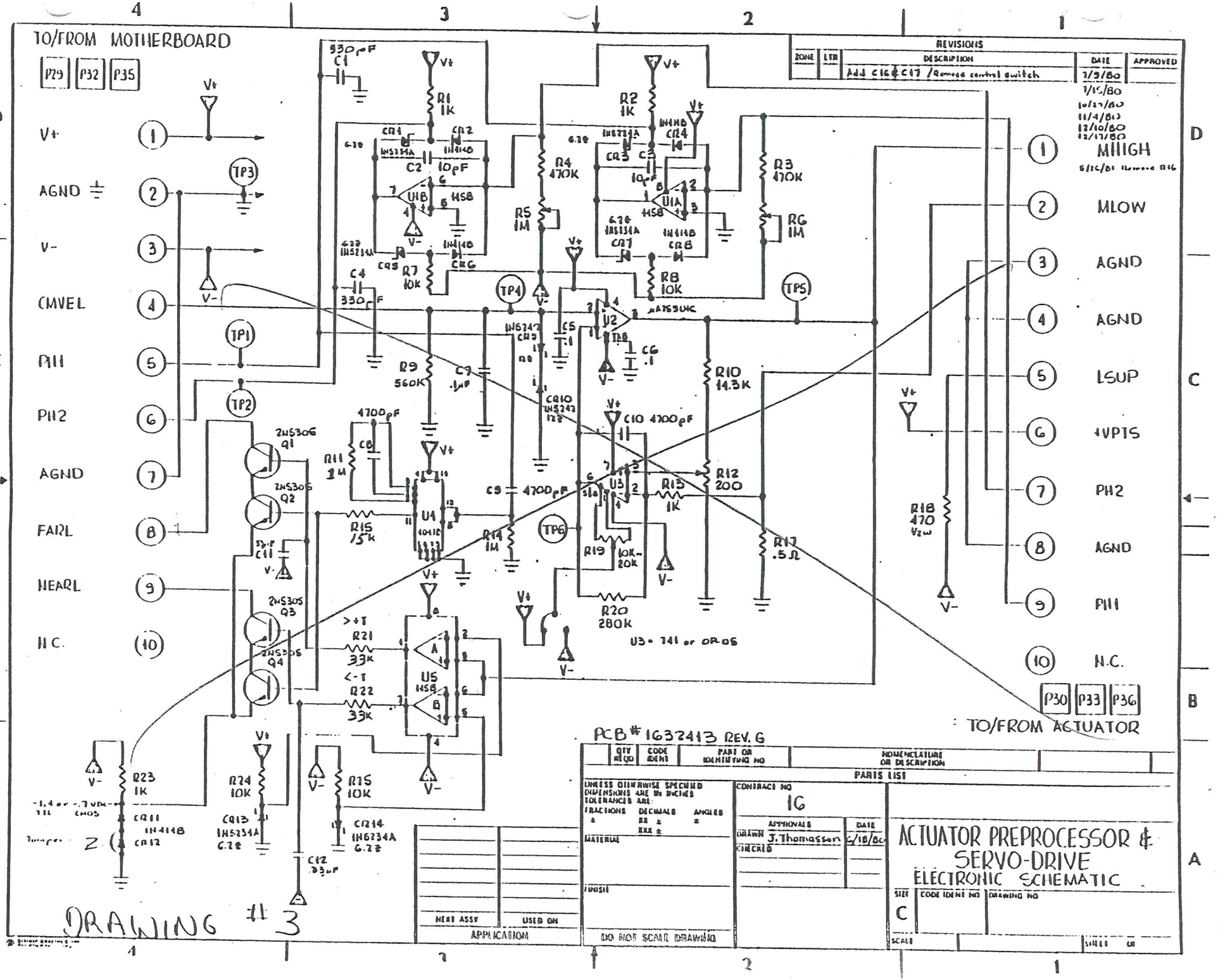
SIZE	CODE IDENT NO.	DRAWING NO.
C		1096

SCALE

SHEET OF

NEXT ASSY	USED ON
APPLICATION	

BISHOP GRAPHICS, INC


TO/FROM MOTHERBOARD
P29
P32
P35
V+
AGND
V-
CMVEL
PH1
PH2
AGND
FAIRL
NEARL
N.C.
TP1
TP2
TP3
TP4
TP5
TP6
C1 330pF
R1 1K
R2 1K
R3 470K
R4 470K
R5 1M
R6 1M
R7 10K
R8 10K
C2 10pF
C3 10pF
C4 330pF
C5 .1
C6 .1
C7 .1μF
R9 560K
R10 14.3K
C8 4700pF
C9 4700pF
C10 4700pF
R11 1M
R12 200
R13 1K
R14 1M
R15 15K
R17 .5Ω
R18 470 2W
R19 10K-20K
R20 280K
C11 .33μF
R21 33K
R22 33K
R23 1K
R24 10K
R25 10K
C12 .33μF
2N5306 Q1
2N5306 Q2
2N5305 Q3
2N5305 Q4
U1 4041B
U2 LM339HC
U3 LM339HC
U4 4041B
U5 LM358
U3 = 741 or OP-05
MHIGH
MLOW
AGND
AGND
LSUP
+VPTS
PH2
AGND
PH1
N.C.
P30
P33
P36
TO/FROM ACTUATOR
REVISIONS
ZONE | LTR | DESCRIPTION | DATE | APPROVED
Add C16 & C17 /Remote control switch | 7/9/80
7/15/80
10/27/80
11/4/80
12/10/80
12/17/80
5/12/81 Remove R16
PCB # 1632413 REV. G
PARTS LIST
QTY REQD | CODE IDENT | PART OR IDENTIFYING NO | NOMENCLATURE OR DESCRIPTION
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS ± DECIMALS .XX ± .XXX ± ANGLES ±
MATERIAL
FINISH
DO NOT SCALE DRAWING
CONTRACT NO 16
APPROVALS | DATE
DRAWN J. Thomassen 6/15/81
CHECKED
NEXT ASSY | USED ON
APPLICATION
ACTUATOR PREPROCESSOR & SERVO-DRIVE ELECTRONIC SCHEMATIC
SIZE C | CODE IDENT NO | DRAWING NO
SCALE | SHEET OF
DRAWING # 3

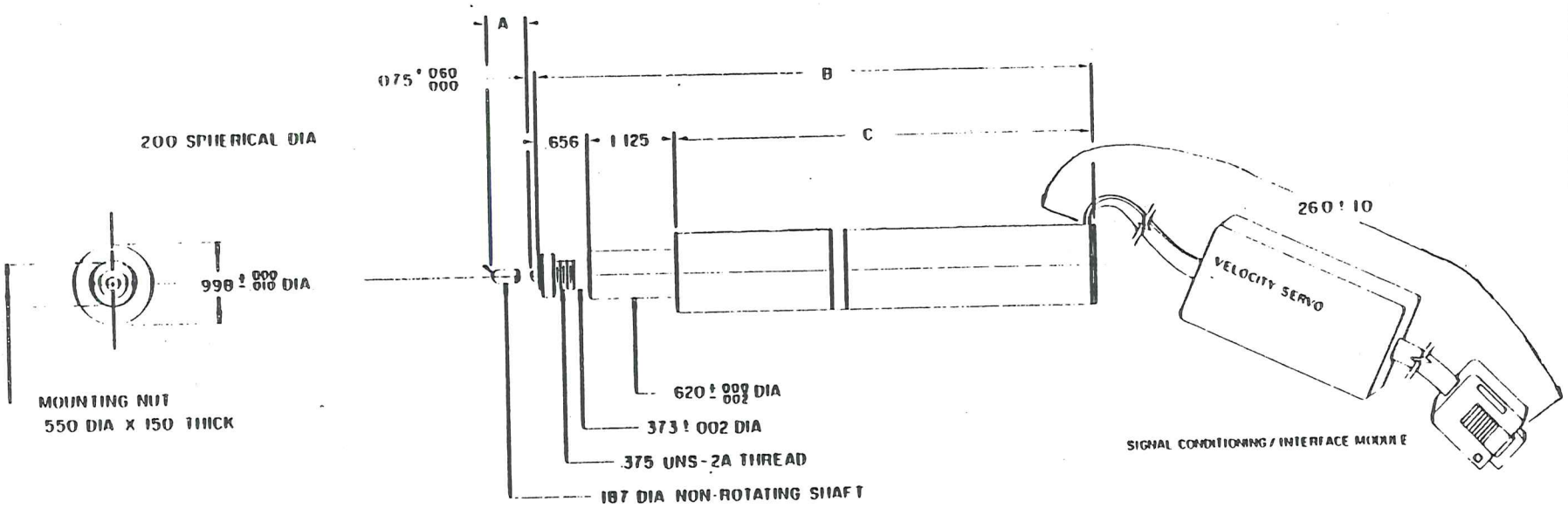
APPENDIX C

TROUBLE SHOOTING

SYMPTOM	CORRECTION
Actuator moves slowly without external command velocity signal.	Temperature environment may be outside desirable operating range of 0-65°C.
	Servo zero adjustment may be faulty. See Appendix B for correction procedure.
	Bridge shape adjustment may be faulty. See Appendix B for correction procedure.
	Unit may be older version, return to factory for correction or ask factory for field Servo replacement.
	Actuator mechanics frozen, return to factory for repair.
Actuator won't move.	If using actuator without our Controllers, you may have connected the cable wiring incorrectly. Check Section 4.0 and Appendix A of the Operator's Manual. This error usually results in permanent damage. Return to factory for repair.
	Foreign material may be jamming the gearhead, return to factory for repair.
Actuator has a buzzing sound at the limits.	Normal condition since a small rubber bumper at the limit exerts some back pressure on the motor and the servo system continually resists back motion. Moving off the limit will stop the buzzing.

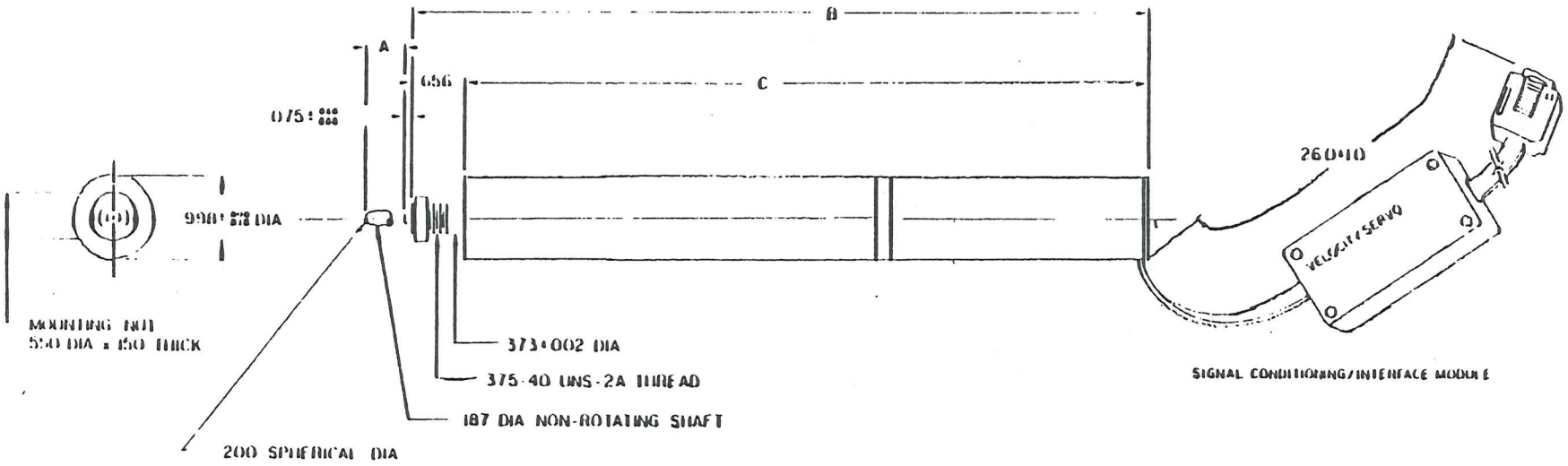
APPENDIX D

ACTUATOR DIMENSIONS



MODEL NUMBER	A TRAVEL	B OVERALL	C BODY LENGTH
850-05	0.50	7.418	5.637
850-1	1.00	8.218	6.437
850-2	2.00	10.218	8.437

All measurements in inches.



MODEL NUMBER	A TRAVEL	B OVERALL	C BODY LENGTH
850-4	4.00	15.218	14.563
850-6	6.00	19.539	18.883

All measurements in inches.

WARRANTY STATEMENT

All products listed in this manual are guaranteed against defects in materials and workmanship for a period of one year after equipment acceptance. Specifications for the hardware and accessories are current at the time of publication; however, the factory reserves the right to change or improve the design. If the factory is notified of any defects during the warranty period, the factory will, at its option, either repair or replace the product proven to be defective.

The foregoing warranty shall not apply to defects resulting from improper maintenance, misuse, or unauthorized modifications made by the user.