

**INSTRUCTION MANUAL**  
**FOR**  
**AFCPRB**  
**SINGLE ELEMENT ROTATOR**

**PINE INSTRUMENT COMPANY**  
**101 INDUSTRIAL DRIVE**  
**GROVE CITY, PA 16127 U.S.A.**

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**SEPTEMBER 1993**



# AFCPRB ROTATOR

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# AFCPRB ROTATOR

## 1.0 INTRODUCTION

### 1.1 GENERAL

Pine Instrument Company's AFCPRB rotator is a solid state controlled servo system designed to control the speed of a rotating electrode. The system is equipped with an electrode system that permits easy tip changes.

### 1.2 SPECIFICATIONS

Power:	115 VAC or 230 VAC, 50/60 Hz, factory connected.
Weight:	Electronic Control Unit: Body/Base Assembly 14.5 lbs.(6.6 kg).
Operating Temperature:	10 Deg. C to 40 Deg. C.
Dimensions:	ECU: 5-1/8" x 3-5/8" x 6-1/4". Base: 3/4" x 11" X 15". Height: 21-1/4".
Motor:	Permanent magnet DC, ironless rotor.
Motor Power Supply:	+24 VDC nominal.
Speed Control:	Closed loop servo-system; tach generator is mounted on the motor shaft and provides rotational speed information.
Speed Range:	100 to 8,000 RPM.
Accuracy:	Better than 3% of pot setting.
Controls:	On-Off switch; Pushbutton pot to set speed.
Rear Panel Connections:	1) Input jack for speed control via external source (1V/4000 RPM). 2) Output jack gives a voltage proportional to rotational speed: 1V/1000 RPM +/- 5%. 3) Common jack is DC common, isolated from the case. 4) Ground terminal is connected to the case and the ground lead of the power cord. 5) Motor stop jack for stopping motor via externally applied TTL-level signal
Hardware Supplied:	1 Body-Base Assembly (includes motor, tach and control).
Documentation Supplied:	Instruction manual, inspection sheet.
Optional Electrodes:	Disk Type, 4.0 MM O.D. Disk, 12.0 MM O.D. shroud-AG, AU, GC, PG, PT, etc. many special types available, contact the factory.

# AFCPRB ROTATOR

## 2.0 OPERATION

### 2.1 INITIAL INSPECTION

Inspect the packing case and rotator for any damage; notify the carrier and Pine Instrument Company in case of any apparent damage.

Check the shipment against the packing list. Included with the rotator should be:

- 1 - Electronic Control Unit/Motor Assembly
- 1 - Instruction Manual
- 1 - Inspection Sheet
- 1 - AC Power Cord
- Electrodes Per Packing List (Optional)

### 2.2 GENERAL

Pine Instrument Company's AFCPRB Rotator is a solid state controlled servo-system capable of rotating an electrode at speeds from 100 to 8,000 RPM. The speed may be set on a digital push button pot located on the front panel of the control box. The speed is calibrated to within 3% of the pot setting.

The motor/tach assembly is located in the control box, which is mounted on the vertical post. Also located on the vertical post is a cell shelf whose position, like that of the control box, may be easily adjusted up and down and also into any circular position around the post. This permits easy access to the cell and easy removal of the electrode from the cell. The base and cell shelf are made of polypropylene that resists most chemicals in normal rotator applications.

The back panel of the control box houses a group of banana-style jacks that allow external control of the rotator's speed, start/stop and also provides an output voltage signal proportional to the rotational speed. There is also a connector on the back panel that is connected to the AFCPRB'S case, which is in turn connected to the earth ground connection of the power cord. This connector permits easy connection to ground for use in line frequency noise reduction techniques.

There is a banana style jack connector which is used to make the electrical connection to the electrode. The electrode system is unique to the AFCPRB in that the tips, which contain the actual electrode surface, are easily interchangeable.

### 2.3 DESCRIPTION

#### ELECTRONIC CONTROL BOX

##### Front Panel

- |               |  |
|---------------|--|
| Power Switch: | Press the right half of this rocker switch to apply power to unit.   |
| Speed Adjust: | This four digit pushbutton pot is used to set the rotational speed of the electrode. The reading is direct in RPM's up to 9,999. |

## AFCPRB ROTATOR

### Rear Panel

- AC Power Cord:** The cord is detachable from the control box on the socket end. The plug end is to be connected to a 3-prong 115 volt AC 50/60 Hz. outlet with a good quality earth ground. The unit may be factory wired for 230 volts.
- Output Jack:** A voltage output is available at this banana style jack that is proportional to the speed of rotation: 1 volt per 1000 RPM. The output current should not exceed about 5 milliamps.
- Common Jack:** This banana style jack is connected to DC common of the internal circuitry; it is not connected to the case of the unit or to earth ground.
- Input Jack:** A voltage may be applied to this banana style jack from an external source, to cause the rotator to turn at a rate of 4000 RPM per volt applied. The voltage applied at this point is summed with the pot setting. For example: if the speed adjust pot is set for 1500 RPM and +0.25 volts are applied to the input jack, the rotational speed of the electrode will be 2500 RPM. The input impedance is 25K ohms.
- Motor Stop Jack:** A TTL high level signal applied to this banana style jack will cause the motor to stop rotating; this may be useful in computer controlled systems. It is also possible to shut down the motor via a low signal; this requires a change to the internal factory setting. See section below on "Motor Stop Jack Polarity".
- Case Connection:** A banana/binding style post is provided to facilitate connection to the case and, in turn, earth ground. This connection may be used to connect to the common jack in systems that have excessive line noise.

### BODY/FRAME ASSEMBLY

- Base:** The base is made of polypropylene which is resistant to most chemicals. It supports the column and control unit.
- Column:** The column is a vertical rod that supports the control box and electrode assembly unit, the cell holder shelf and collars, all which tighten to the column via thumb screws.
- Cell Holder Shelf:** Made of the same material as the base; supports the cell; may be moved up and down or rotated in a complete arc about the column.

## AFCPRB ROTATOR

### 2.4 MOTOR STOP JACK POLARITY CHANGE

The MOTOR STOP jack, located on the rear panel, is factory connected such that a TTL high level signal applied to this jack will cause the motor to stop. This may be changed to permit a TTL low level signal to stop motor rotation, by performing the following procedure:

**CAUTION: This procedure should be performed only by a trained service person, and then only with the instrument completely disconnected from the power source.**

1. Disconnect the power cord from the power source.
2. Remove the cover from the control unit by removing the four screws from the side panels and lifting the cover off.
3. Locate the 3-pin header marked "J2" on the printed circuit board; there is a jumper connected between the center pin and the pin marked "AL"; pull the jumper off the pins, ie. straight away from the circuit board.
4. Push the jumper onto the center pin and the pin marked "AH".
5. The unit is now connected to allow a low level signal to stop the motor. Replace the cover and reconnect the power cord to the power source.

### 2.5 ELECTRODE SYSTEM

The AFCPRB rotator is manufactured with a precision spindle for mounting disk electrodes to the rotator. The spindle contains a threaded section to which the electrode is attached, and also has provision for mounting a contact stud onto the spindle end. These features allow a variety of disk electrode styles to be used on the rotator. The spindle is electrically insulated from the rotator body and tach-motor. A Teflon cover is fastened to the spindle for protection against corrosive agents.

### 2.6 INSTALLING ELECTRODES

To install an electrode, grasp the Teflon spindle cover near the rotator body and thread the electrode onto the spindle. Do not overtighten.

Some electrode designs employ a contact stud. This stud must be threaded into the small tapped hole at the end of the spindle prior to installing the electrode.

Care should be taken not to exert excessive side pressure on the spindle, as it may cause damage to the rotator.

See pages 10-14 for drawings.

# AFCPRB ROTATOR

## 3.0 MAINTENANCE

### 3.1 GENERAL

The AFCPRB rotator is covered by a six month warranty. Attempts to repair, recalibrate or modify the instrument by an unauthorized person may invalidate the warranty. It is suggested that the factory be advised on all matters of improper operation.

### 3.2 TROUBLE SHOOTING

This section provides some suggestions for an operator to follow in the event of problems.

<u>Problem</u>	<u>Cause and/or action</u>
Motor fails to rotate	Check the motor shaft and spindle for freedom of rotation. Confirm that the unit is connected to a live outlet of the proper voltage and that the power switch is "on". The 4-digit pot is to be set to a speed other than "0". Faulty connection or wire - contact the factory. Faulty circuitry or motor - contact the factory.
Motor runs at high speed at any dial setting	Faulty connection or wire - contact the factory. Faulty circuitry - contact the factory.
Excessive noise	Spindle bearings are worn - contact the factory. Motor bearings are worn - contact the factory.
Excessive electrical noise in system	Connect DC Common to Ground Jack; use only one point in the system as the common; eliminate ground loops.  <b>CAUTION:</b> Care must be taken when making connections to ground. This should be done only on a "floating" system. Contact the factory for more information.  Use shielded cable for connection to the brush. Clean the surface where the brush contacts the rotating rings.



## AFCPRB ROTATOR

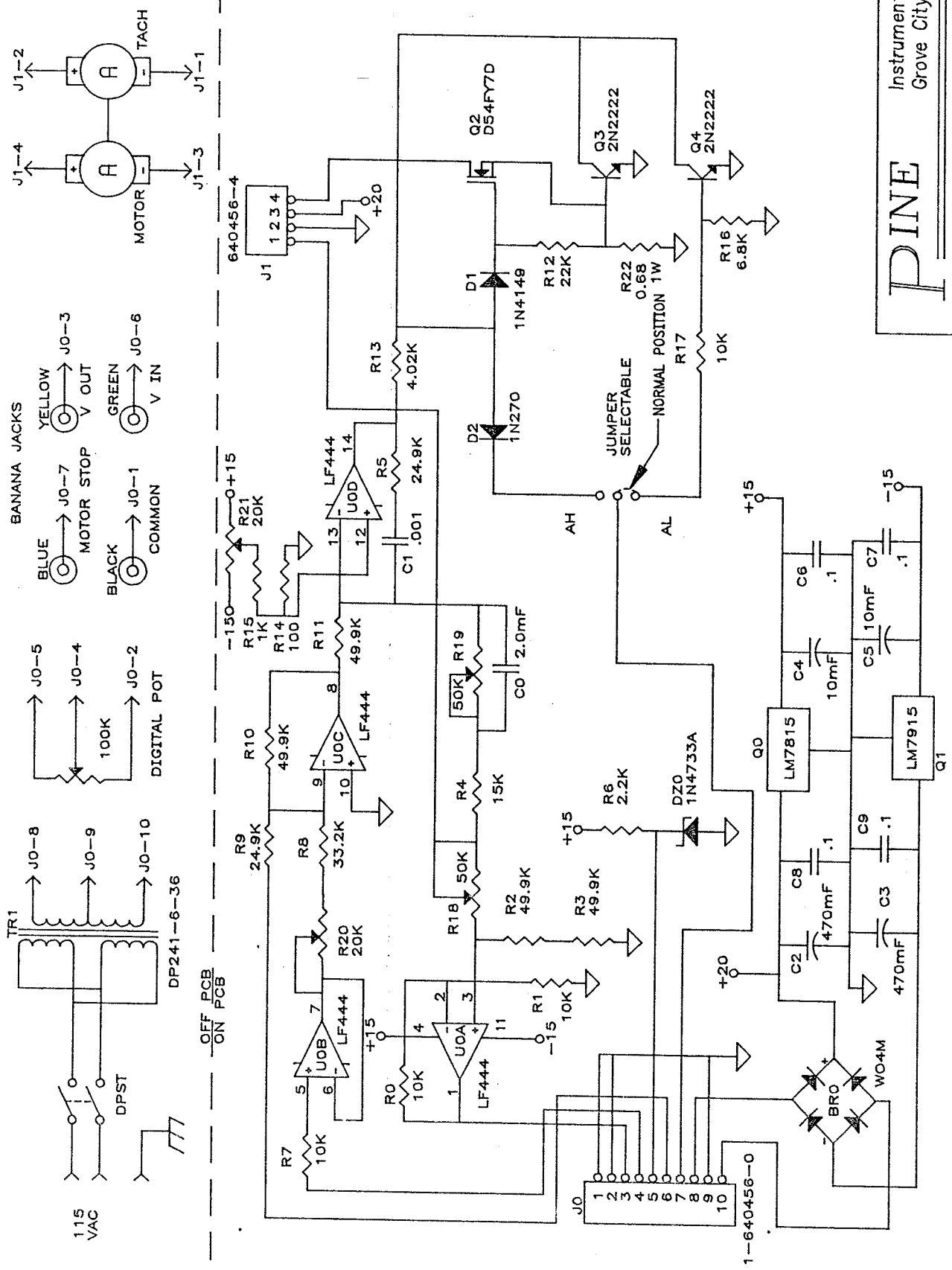
### 4.0 WARRANTY

The AFCPRB Rotator unit manufactured by Pine Instrument Company is warranted to be free from defects in material and workmanship for a six month period from date of shipment to original purchaser and when used under normal conditions. The obligation under this warranty being limited to replacing or repairing any part or parts which shall upon examination disclose to Pine Instrument's satisfaction to have been defective and shall have been returned freight prepaid and clear of encumbrances to Pine Instrument Company in Grove City, PA. U.S.A. within the warranty period. This warranty being expressly in lieu of all other warranties, expressed or implied and all other obligations or liabilities. All Specifications are subject to change without notice.

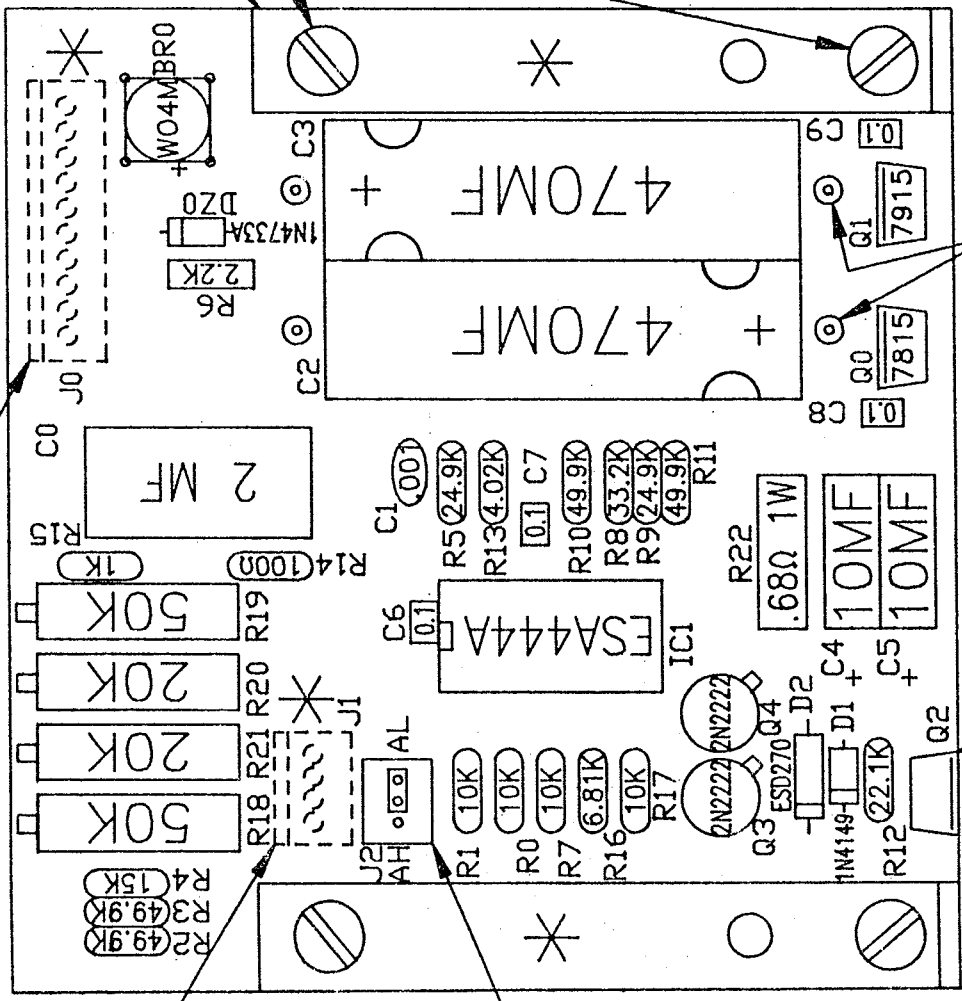


**PINE** Instrument Company  
Grove City, PA 16127

DWN.	JGW	AFCPR ROTATOR	SHEET	REV.
CKD.	RSB	SCHEMATIC	DWG. SIZE	DRAWING NO.
ENG.			A	AFCPR
DATE	9/24/90		1	1/10



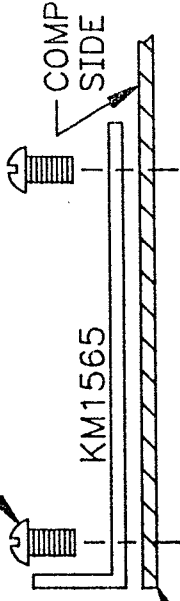
EKN6404564—SOLDER SIDE ← EKN640456—SOLDER SIDE



SEE DETAIL-A

6-32UNC-2B TAP  
(4 PLACES)

6-32 X 1/4" LG. RH  
KSM0632R04SS



DETAIL-A

NOTE—BRACKETS ARE TO BE INSTALLED AFTER BOARD IS CALIBRATED AND DIP COATED. SEE MFG. TEXT.

SEE NOTE 2

D54FY7D(USE JIG)

HEADER—EKN00983  
JUMPER—EKNR65474, INSTALL AFTER WAVE IN AL POSITION

NOTE:

1. \* — INSTALL AFTER WAVE.
2. USE NYLON SPACER(KAX4053)(4 PLCS) TO MOUNT CAPS OFF OF BOARD.

2	9/18/91	ADDED NYLON SPACERS	JNH
1	6/26/91	ADDED NOTE 2	RSB
0	9/26/90	REDRAWN FROM ABCPR R05	JNH

**PINE**  
Instrument Company  
Grove City, PA 16127

DWN.	JNH	CPR PCB ASSEMBLY					
CRD.	JGW						
ENC.							
DATE	9/26/90	DWG. SIZE	A	DRAWING NO.	ABCPR	SHEET	1/12

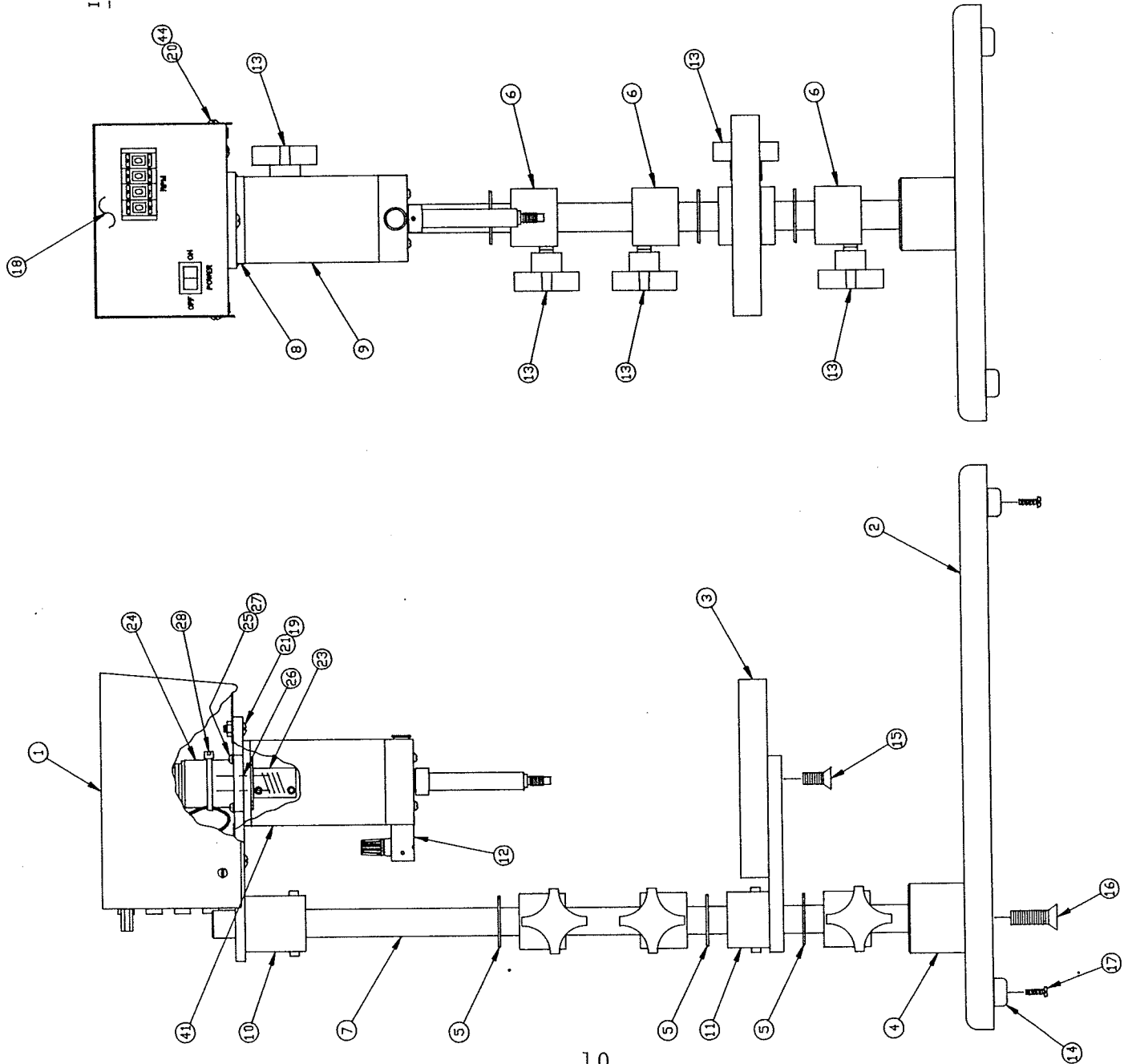
DESCRIPTION

PART NUMBER

ITEM

QTY

1	CPR CONT., ENCLOSURE TOP	ACPR051	1
2	BASE, POLYPROPYLENE CPR MACH.	ACPR001M	1
3	BEAKER PLATFORM, MACHINED	ACPR002M	1
4	BASE COLLAR	ACPR003	1
5	WASHER, NYL .765 x 1.317 x .062	ACPR004	3
6	COLLAR	ACPR005	3
7	CPR COLUMN	ACPR007	1
8	MOTOR-TACH ADAPTER BRACKET	ACPR016	1
9	MOTOR HOUSING ASSY.	ACPR101	1
10	MOUNTING BRACKET ASSY.	ACPR102	1
11	PLATFORM SUPPORT ASSY.	ACPR103	1
12	BRUSH HOLDER ASSY.	ACPR126	1
13	KNOB ASSY.	ACHR3163	1
14	BUMPER, RUBBER 3/4 DIA,	KAU2194	4
15	SCREW, CAP 5/16-18 x 3/4 FH SS	KBC3118F06HS	4
16	SCREW, CAP 3/8-16 x 1-1/4 FH BX	KBC3816F10HB	1
17	SCREW, 6-32 x 1/2 PH ZINC	KSM0632P08C	4
18	CPR ROTATOR CONTROLLER ASSY.	ACPR400B	1
19	NUT, 8-32 KEP PLTD.	KN00832KP	3
20	SCREW, 4-40 x 1/4 TH SS	KSM0440T04SS	4
21	SCREW, 8-32 x 1/2 TH SS	KSM0832T08SS	4
22	WIRE, CORD SET BELDEN #17500	EMW18B7	1
23	FLEXIBLE COUPLING	KANVAC15	1
24	MOTOR ASSY. FOR CPR ROTATOR	ACPR105	1
25	SCREW, 6-32 x 3/4 RH SS	KSM0632R12SS	4
26	SCREW, CAP M2 X 8 LG.BOX	KSM20C08HB	3
27	WASHER, #6 SPLIT LOCK	KWS006	4
28	CABLE TIE, T & B 524M	KANM524	4
29	SPINDLE COVER	ACPR025	1
30	BRUSH-HOLDER PLUG	ACPR021	1
31	SPINDLE, CPR	ACPR014	1
32	BODY, MAIN	ACPR017	1
33	PVC BRUSH-HOLDER COLLAR	ACPR015	1
34	SPINDLE RETAINING PLATE	ACPR020	1
35	BEARING SLEEVE, TOP	ACPR019	1
36	BEARING SLEEVE, BOTTOM	ACPR018	1
37	SCREW, 4-40 x 1/4 RH SS	KSM0440R04SS	4
38	SCREW, 6-32 x 1 RH SS	KSM0632R16SS	4
39	LAMINATED SHINY SPACER	KWNSV7E	2
40	BEARING PRELOAD SPRING	KAB8516	2
41	SCREW, SET 10-32 X 1/4 SS	KSS1032N04HS	1
42	BEARING	KAB8516	2
43	SHIM .005 THK.	KWN005SS	2
44	WASHER, LOCK INT. TOOTH #4	KWT004	4

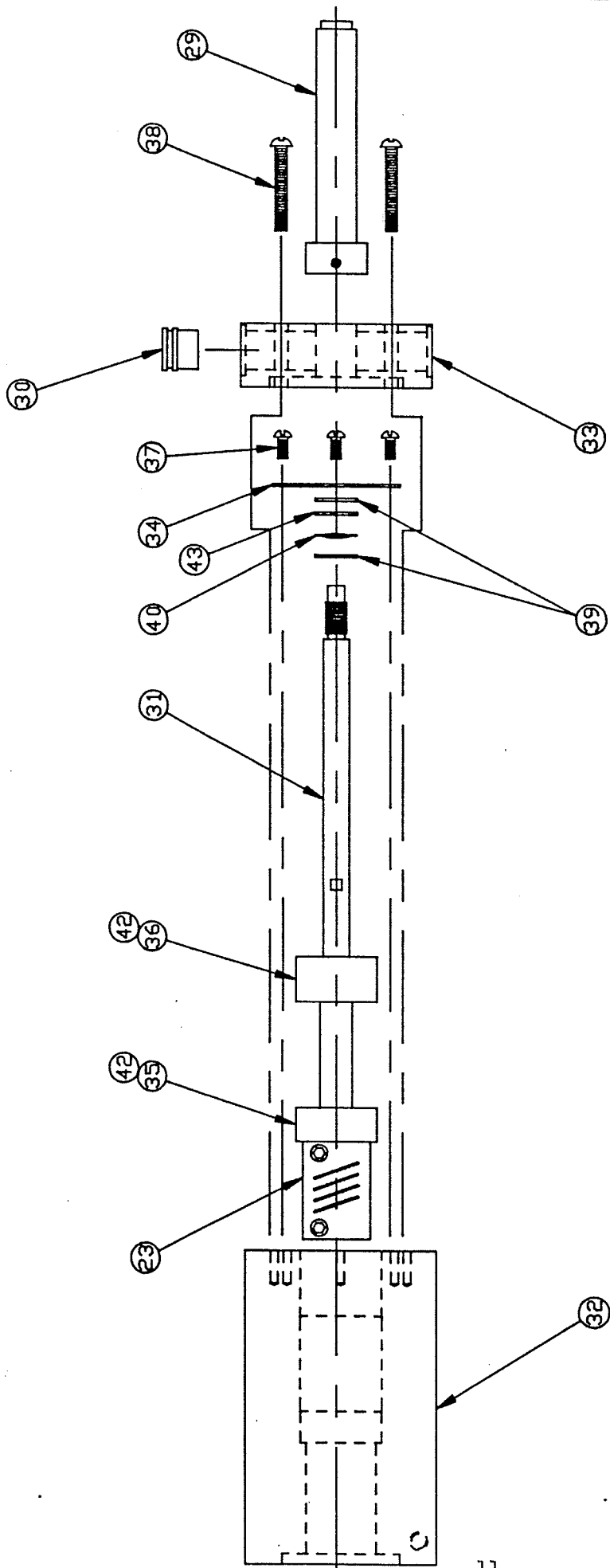


4	6/2/93	REV. ECO #333, FLEXIBLE COUPLING	JNH
3	8/17/92	ADDED ITEM 44	JNH
2	4/22/92	PER ECO #282, CHGD. ITEMS 23 & 41	RSB
1	4/1/92	REV. ITEM 16 WAS XBC3816S12HB	JNH

**PINE**  
Instrument Company  
Grove City, PA 16127

DATE	REV.	BY	CHKD.
12/5/90	B	ACCPRB-M	1/2/4

01CPRBM

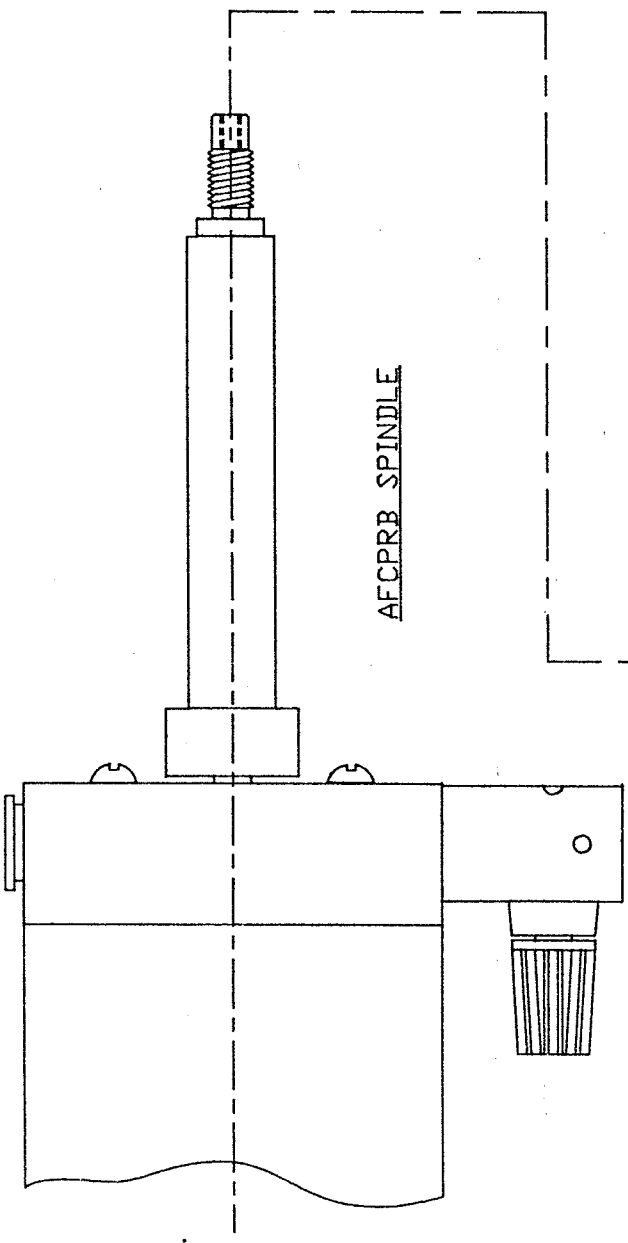


NOTE: PRELOAD TO BE BETWEEN .5 AND 1.5 POUNDS. USE 1 OR 2 BEARING PRELOAD SPRINGS (KWNSV8) AND SHIM WASHERS (KWN005SS) AS REQUIRED.

2	6/2/93	REV. PER ECO #333, FLEX COUPLING	JNH
1	4/22/92	PER ECO #282, CHG'D. ITEMS 31 & 41	RSB

**PINE**  
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Grove City, PA 16127

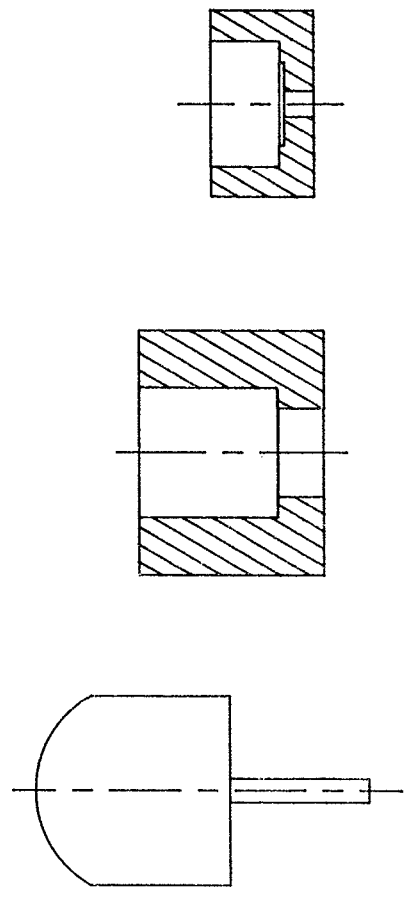
DWG.	RSB	CPR ROTATOR ASSEMBLY	
CRD.	RAP	MECHANICAL PARTS LIST	
ENG.	RAP	DWG. SIZE	DRAWING NO.
DATE	12/5/90	A	ACCPRB-M 2/2 2



AF CPRB SPINDLE

CONTACT STUD  
 QUICK CHANGE BODY  
 DISK HOLDER  
 DISK (OPTIONAL)

ELECTRODE TIP

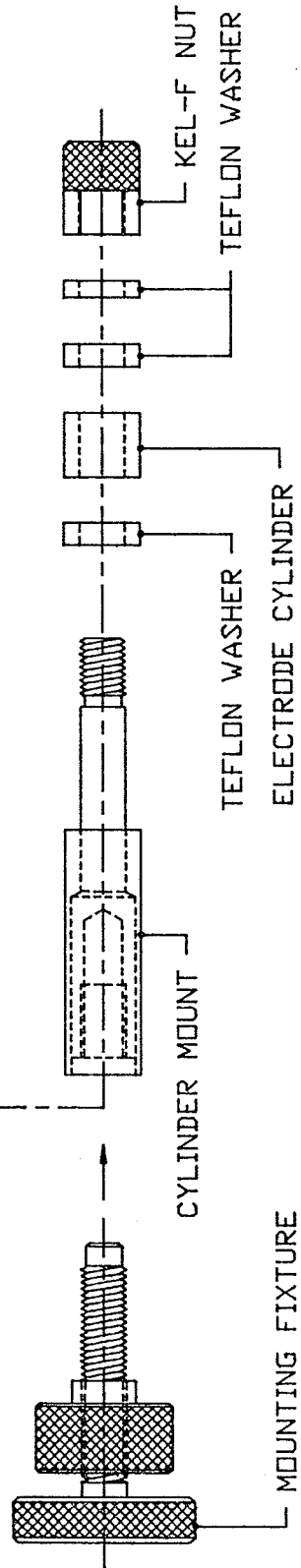
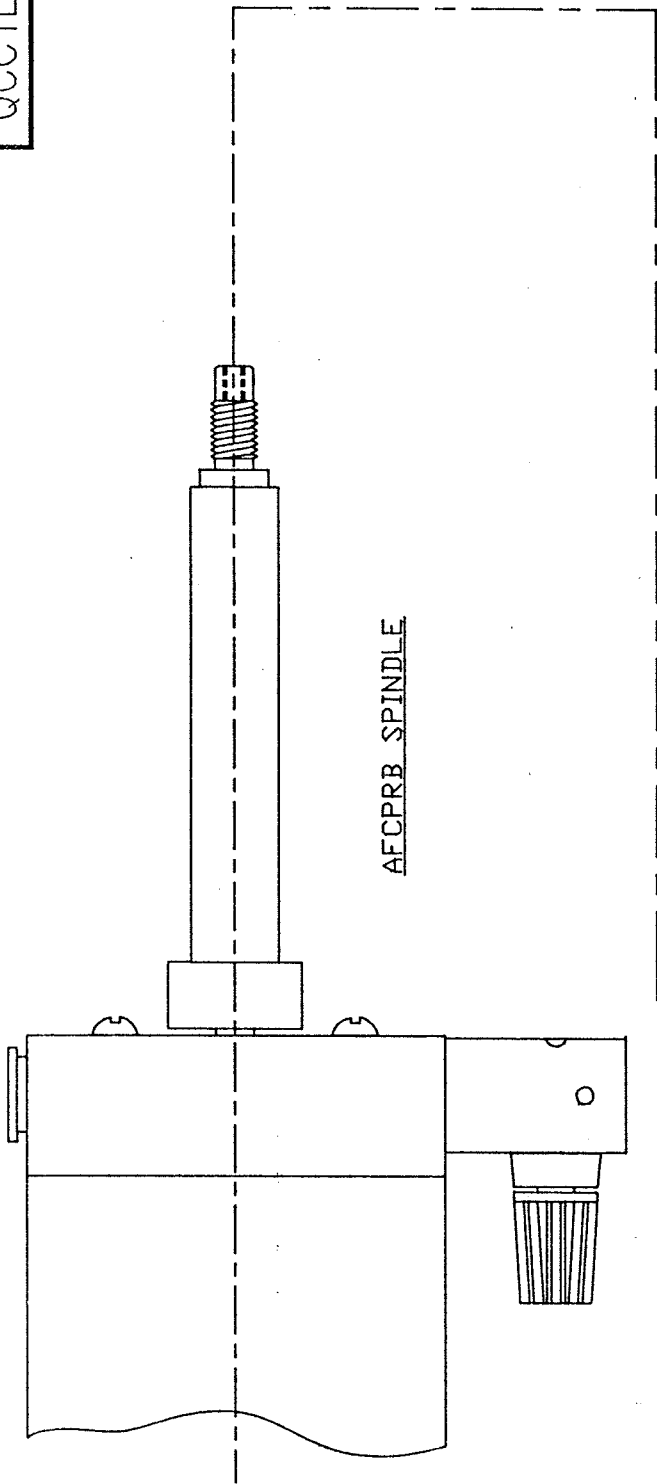


DISK INSERTION/REMOVAL TOOLS

**PINE**

Instrument Company  
 Grove City, PA 16127

DWG. NO.	RSB	DISK ELECTRODE
ENG. NO.	RAP	QUICK CHANGE - STYLE QC
DATE	12/6/90	DWG. SIZE
	A	DRAWING NO.
	QC-CPRB	SHEET
	1/10	REV.



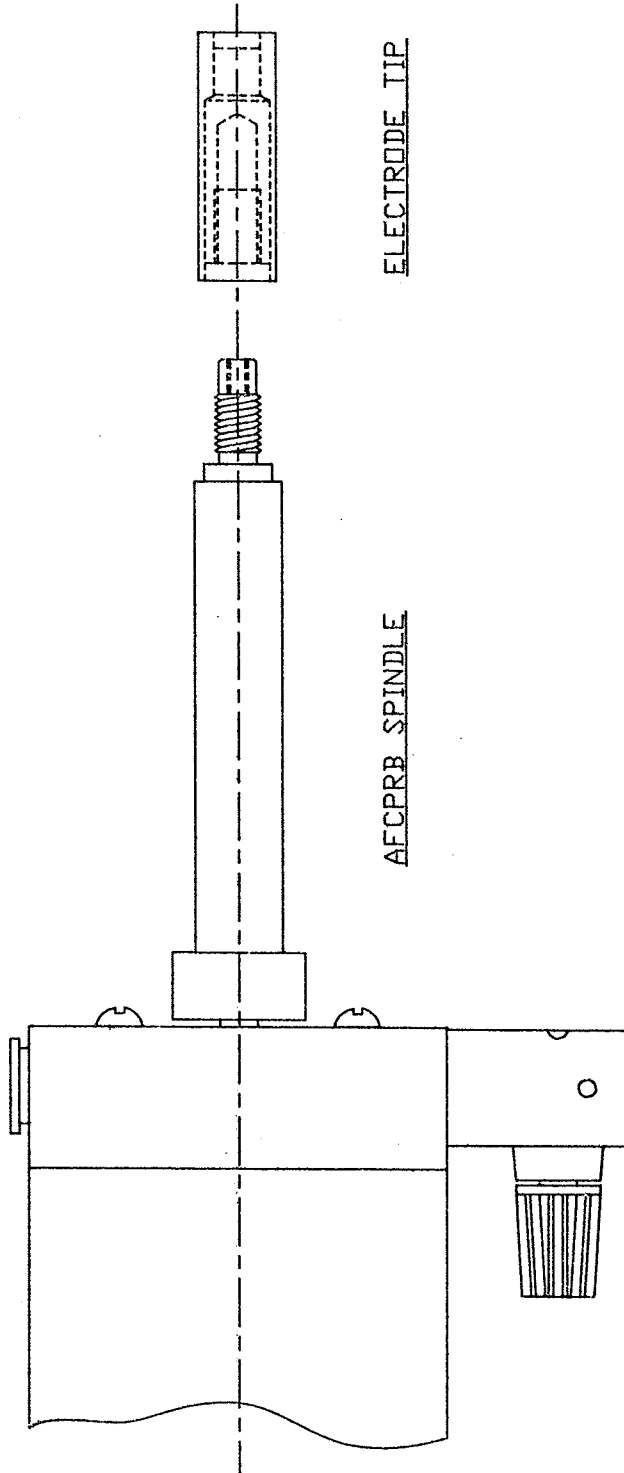
ELECTRODE TIP

<b>PINE</b>		Instrument Company Grove City, PA 16127	
DWR. RSB	CYLINDER ELECTRODE	DWG. SIZE	SHEET
CKD. RAP	QUICK CHANGE - STYLE QC	A	1/10
ENG. RAP	DRAWING NO.	QCCYL-CPRB	REV.
DATE 12/6/90			

wCYLUR



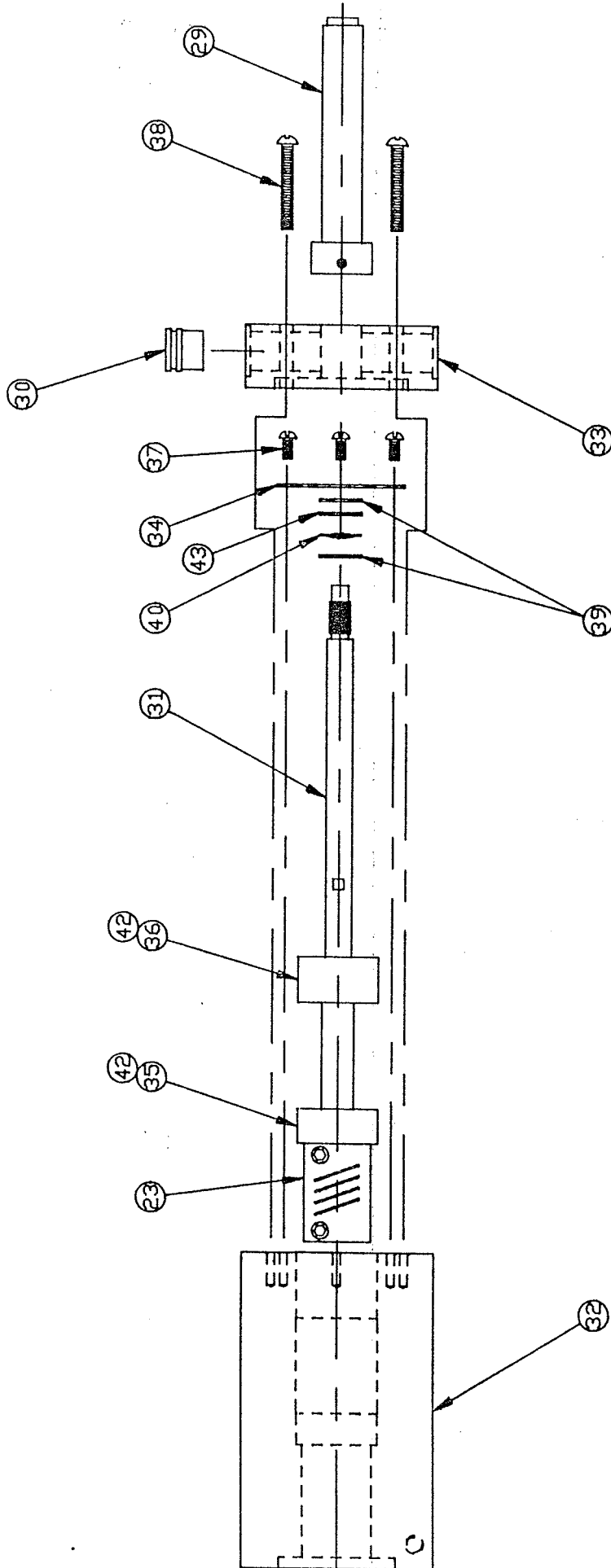
DRAWING NO. **VD-CPRB** SHEET **1/1** REV. **0**



**PINE**

Instrument Company  
Grove City, PA 16127

DWG. NO.	RSB	DISK ELECTRODE	SHEET	REV.
CHKD.	RAP	STYLE VD	1/1	0
ENG.	RAP	DWG. NO.	VD-CPRB	
DATE	12/7/90	A		

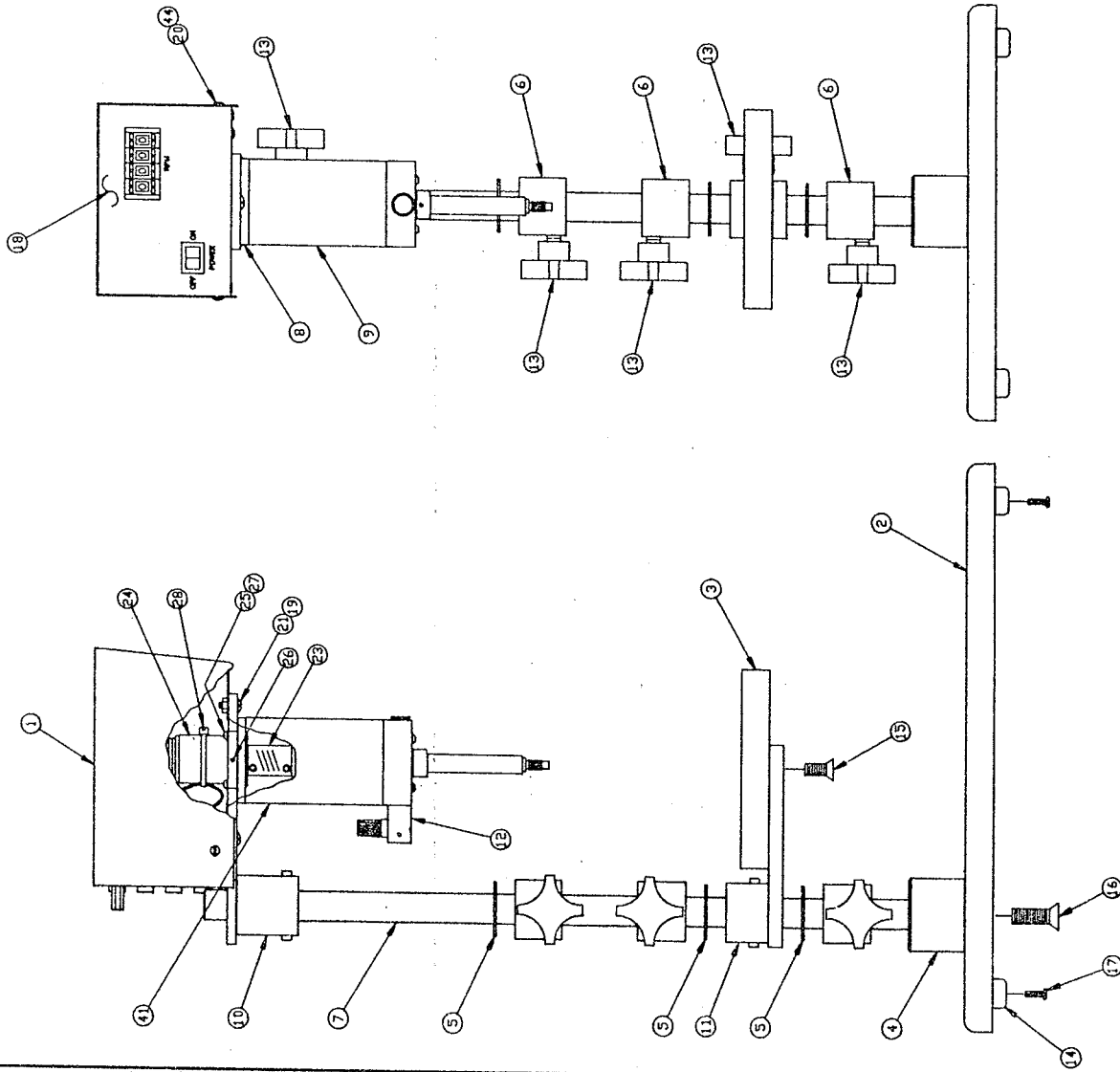


NOTE: PRELOAD TO BE BETWEEN .5 AND 1.5 POUNDS. USE 1 OR 2 BEARING PRELOAD SPRINGS (KWNSV8) AND SHIM WASHERS (KWN005SS) AS REQUIRED.

1	6/3/93	REV. ECO #333, FLEXIBLE COUPLING	JNH
<b>PINE</b>			
Instrument Company Grove City, PA 16127			
DWL	RSB	CPR ROTATOR ASSY., LONG SPDL.	
CKD.	RAP	MECHANICAL PARTS LIST	
ENG.	RAP	DWG. SIZE	DRAWING NO.
DATE	12/4/90	A	ACCPRBS-M 2/2 1

DESCRIPTION	QTY
CPR CONT., ENCLOSURE TDP	1
BASE, POLYPROPYLENE CPR MACH.	1
BEAKER PLATFDRM, MACHINED	1
BASE COLLAR	1
WASHER, NYL .765 x 1.317 x .062	3
COLLAR	3
CPR COLLUMN	1
MOTOR-TACH ADAPTER BRACKET	1
MOTOR HOUSING ASSY, LONG SPDL.	1
MOUNTING BRACKET ASSY.	1
PLATFDRM SUPPORT ASSY.	1
BRUSH HOLDER ASSY.	1
KNDB ASSY.	5
BUMPER, RUBBER 3/4 DIA.	4
SCREW, CAP 5/16-18 x 3/4 FH SS	1
SCREW, CAP 3/8-16 x 1-1/4 FH BX	1
SCREW, 6-32 x 1/2 PH ZINC	4
CPR ROTATOR CONTROLLER ASSY.	1
NUT, 8-32 KEP PLTD.	3
SCREW, 4-40 x 1/4 TH-SS	4
SCREW, 8-32 x 1/2 TH SS	3
WIRE, CORD SET BELDEN #17500	1
FLEXIBLE COUPLING	1
MOTOR ASSY. FOR CPR ROTATOR	1
SCREW, 6-32 x 3/4 RH SS	4
SCREW, CAP M2 X 8 LG BDX	4
WASHER, #6 SPLIT LOCK	4
CABLE TIE, T & B 524H	1
SPINDLE COVER, LONG	1
BRUSH-HOLDER PLUG	1
SPINDLE, LONG, CPR	1
BODY, MAJN	1
PVC BRUSH-HOLDER COLLAR	1
SPINDLE RETAINING PLATE	1
BEARING SLEEVE, TOP	1
BEARING SLEEVE, BOTTOM	1
SCREW, 4-40 x 1/4 RH SS	4
SCREW, 6-32 x 1 PH SS	4
LAMINATED SHINY SPACER	2
BEARING PRELOAD SPRING	2
SCREW, SET 10-32 X 1/4 SS	1
BEARING	2
WASHER, SHIM .005 THK.	2
WASHER, LOCK INT, TOOTH #4	2

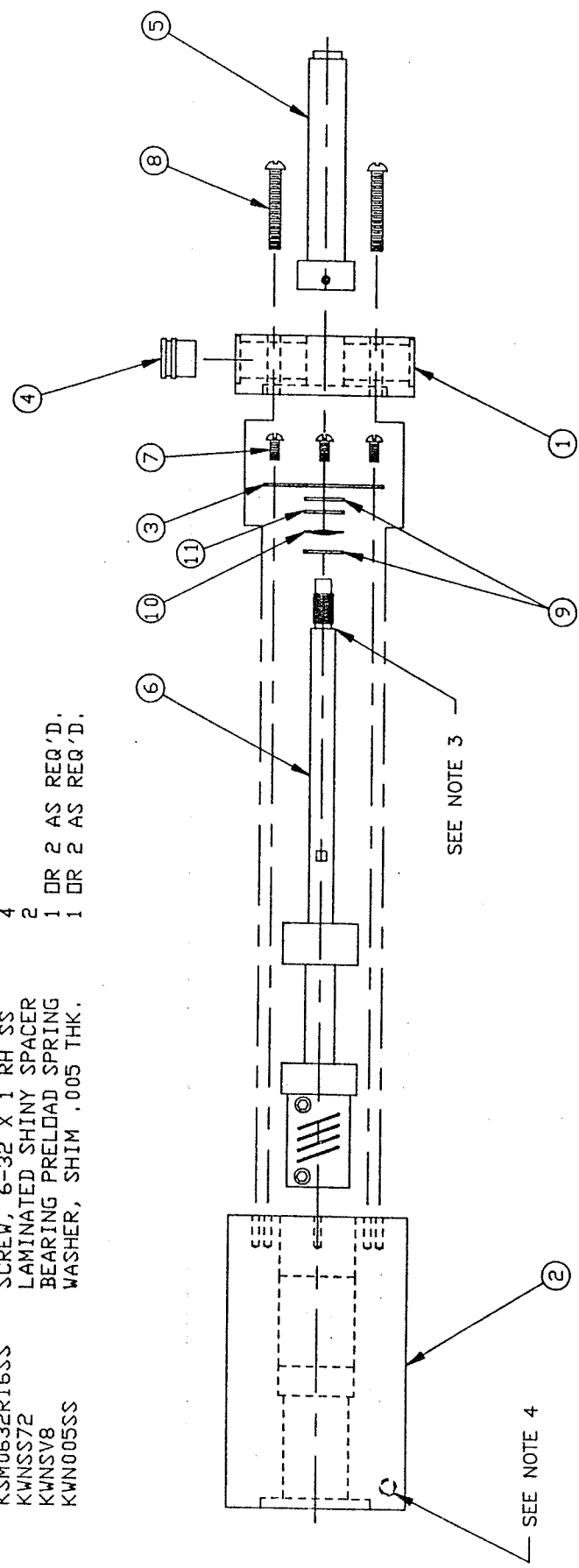
ITEM	PART NUMBER
1	ACPR051
2	ACPR001M
3	ACPR002M
4	ACPR003
5	ACPR004
6	ACPR005
7	ACPR007
8	ACPR016
9	ACPR101S
10	ACPR102
11	ACPR102
12	ACPR126
13	ACHR3163
14	KAU2194
15	KBC3118F06HS
16	KBC3816F10HB
17	KSM0632P08C
18	ACPR400B
19	KN00832KP
20	KSH0440T04SS
21	KSH0832T08SS
22	EMH18B7
23	KANWAC15
24	ACPR105
25	KSM0632R12SS
26	KSMH20C08HB
27	KMS006
28	KANH524
29	ACPR025S
30	ACPR021
31	ACPR017
32	ACPR015
33	ACPR020
34	ACPR019
35	ACPR018
36	ACPR016
37	KSH0440R04SS
38	KSH0632R16SS
39	KMSV72
40	KMSV6
41	KSS102N04HS
42	KAB8516
43	KMN005SS
44	KMT004



3	6/4/93	REV. ECO #133, FLEX COUPLING	JNH
2	8/17/92	ADDED ITEM 44	JNH
1	4/1/92	REV. ITEM 16 WAS KBC3816S12HB	JNH
<b>PINE</b> Instrument Company Grove City, PA 16127			
REV.	DATE	BY	REV.
	12/4/90	B	1/2-3
CPR ROTATOR ASSEMBLY, LONG SPDL MECHANICAL PARTS LIST			
DATE: 12/4/90 B ACCPRBS-M 1/2-3			

ITEM	PART NUMBER	DESCRIPTION	QTY
1	ACPR015	PVC BRUSH-HOLDER COLLAR	1
2	ACPR017	BODY, MAIN	1
3	ACPR020	SPINDLE RETAINING PLATE	1
4	ACPR021	PLUG FOR BRUSH-HOLDER	1
5	ACPR025	SPINDLE COVER	1
6	ACPR300C	SPINDLE ASSY.	1
7	KSM044DR04SS	SCREW, 4-40 X 1/4 RH SS	4
8	KSM0632R16SS	SCREW, 6-32 X 1 RH SS	4
9	KWNS572	LAMINATED SHINY SPACER	2
10	KWNSV8	BEARING PRELOAD SPRING	1
11	KWN005SS	WASHER, SHIM .005 THK.	1

OR 2 AS REQ'D.  
OR 2 AS REQ'D.



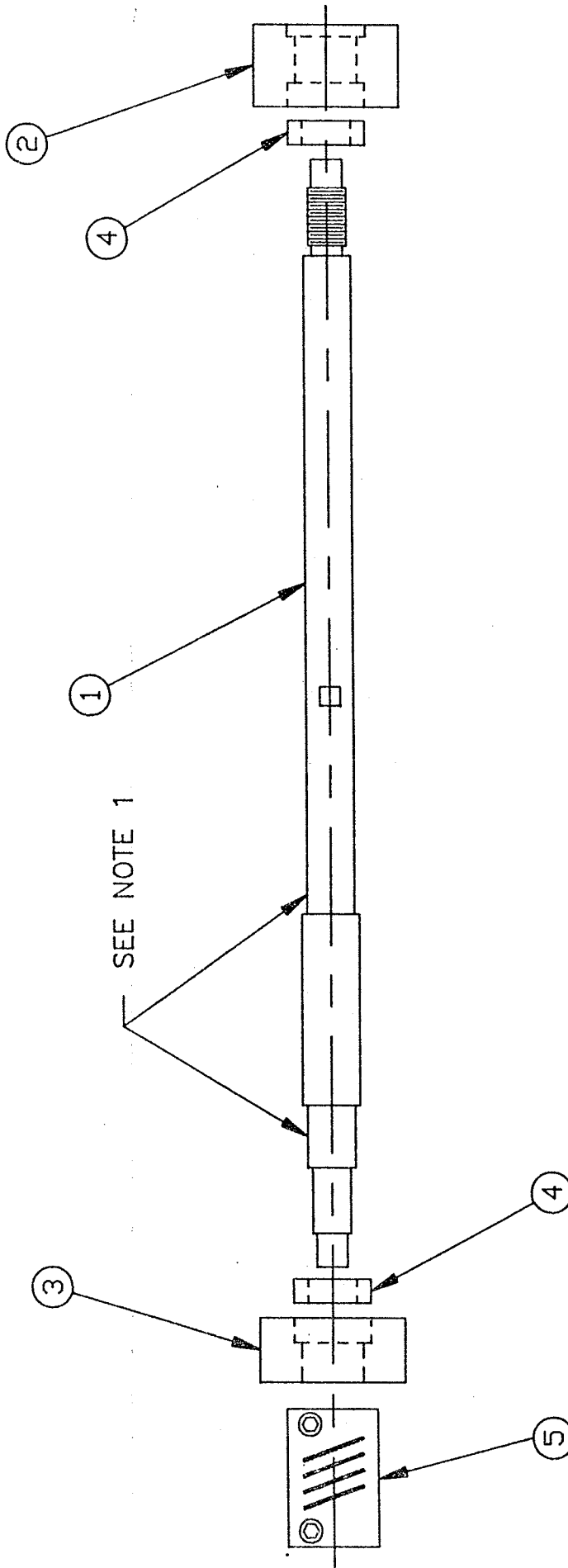
- NOTES:
1. PRELOAD TO BE BETWEEN .5 AND 1.5 POUNDS. USE 1 OR 2 BEARING PRELOAD SPRINGS (KWNSV8) AND SHIM WASHERS (KWN005SS) AS REQUIRED.
  2. APPLY LUBRISAL TO BEARING SLEEVES BEFORE INSTALLING INTO MAIN BODY.
  3. ALIGN END OF SPINDLE COVER WITH EDGE OF SPINDLE COLUMN.
  4. NOTE ORIENTATION OF ITEM 4 TO TAPPED HOLE.

4	6/2/93	ECB #333	JNH
3	4/22/92	PER ECO #282, CHG'D. ITEM 6	RSB
2	12/4/90	ADDED ITEM 11	RSB
1	10/3/90	REDRAWN	RSB

**PINE**  
Instrument Company  
Grove City, PA 16127

DATE	10/3/90	BY	B	ACPR101	SHEET	1/14
MOTOR HOUSING ASSEMBLY						

ITEM	PART NUMBER	DESCRIPTION	QTY
1	ACPR014C	SPINDLE, MAIN, AFCPR	1
2	ACPR018	BEARING SLEEVE, BOTTOM	1
3	ACPR019	BEARING SLEEVE, TOP	1
4	KAB8516	BRG MPG S8516RHH7P28LG39	2
5	KANWAC15	COUPLING, FLEXIBLE 3 MM - 5 MM	1



- NOTES:
1. PRESS FIT BEARINGS ALL THE WAY ONTO SURFACES WHERE INDICATED.
  2. SLIDE BEARING SLEEVES ONTO BEARINGS.
  3. SLIDE COUPLING (KANWAC15) AGAINST SHOULDER.
  - USE ALLEN WRENCH TO TIGHTEN ON MAIN SPINDLE.

**PINE** Instrument Company  
 Grove City, PA. 16127-1091

DWG. JNH	SPINDLE ASSEMBLY	SHEET	REV.
CKD. RAP	FLEX COUPLING	1	10
ENC. RAP	DWG. SIZE	A	ACPR300C
DATE 6/2/93	DRAWING NO.	1/10	

01PR300C