20-3700 SERIES
14" OPTICAL COMPARATOR

INSTRUCTION MANUAL

40-0470-00

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INTRODUCTION

This manual contains the instructions for the installation, operation and maintenance of the SCHERR-TUMICO 20-3700 Series horizontal beam optical comparator.

TABLE OF CONTENTS

SPECIFICATIONS

Machine Dimensions
Length..... 43.5" (1100 mm)
Width..... 20" (500 mm)
Height..... 38" (965 mm)
Height to Screen Center... 28.7" (730 mm)

Work Table
Length..... 20" (500 mm)
Width..... 5" (125 mm)

Clamping Slots..... 2
Allowable Workload.....100 lb. (45 Kg)

Measuring Capacity
X-axis..... 12" (300 mm)
Y-axis..... 6" (150 mm)
Focus..... 2.5" (65 mm)
Scale Resolution.....00005" (.001mm)

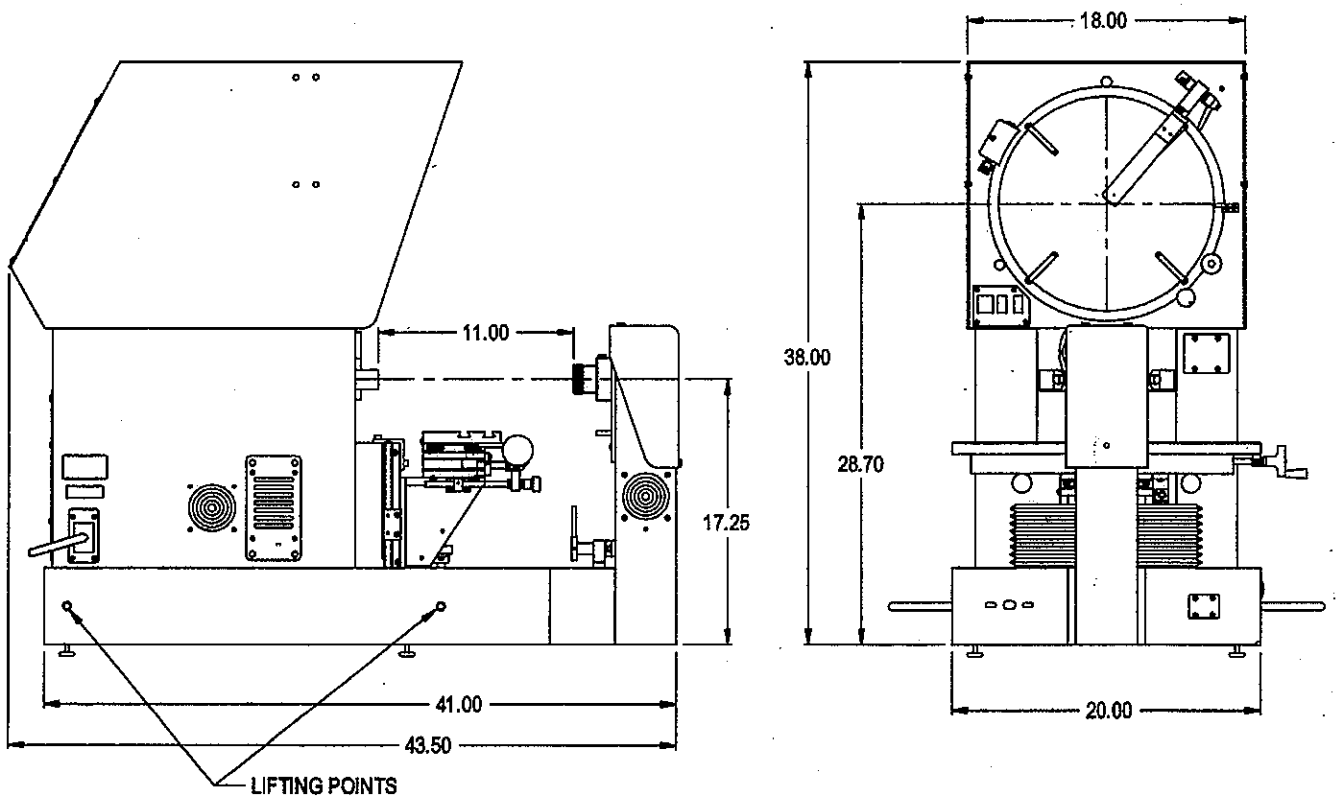
Screen Size..... 14" (400 mm)

Digital Protractor ..... 1 min./.01 deg.

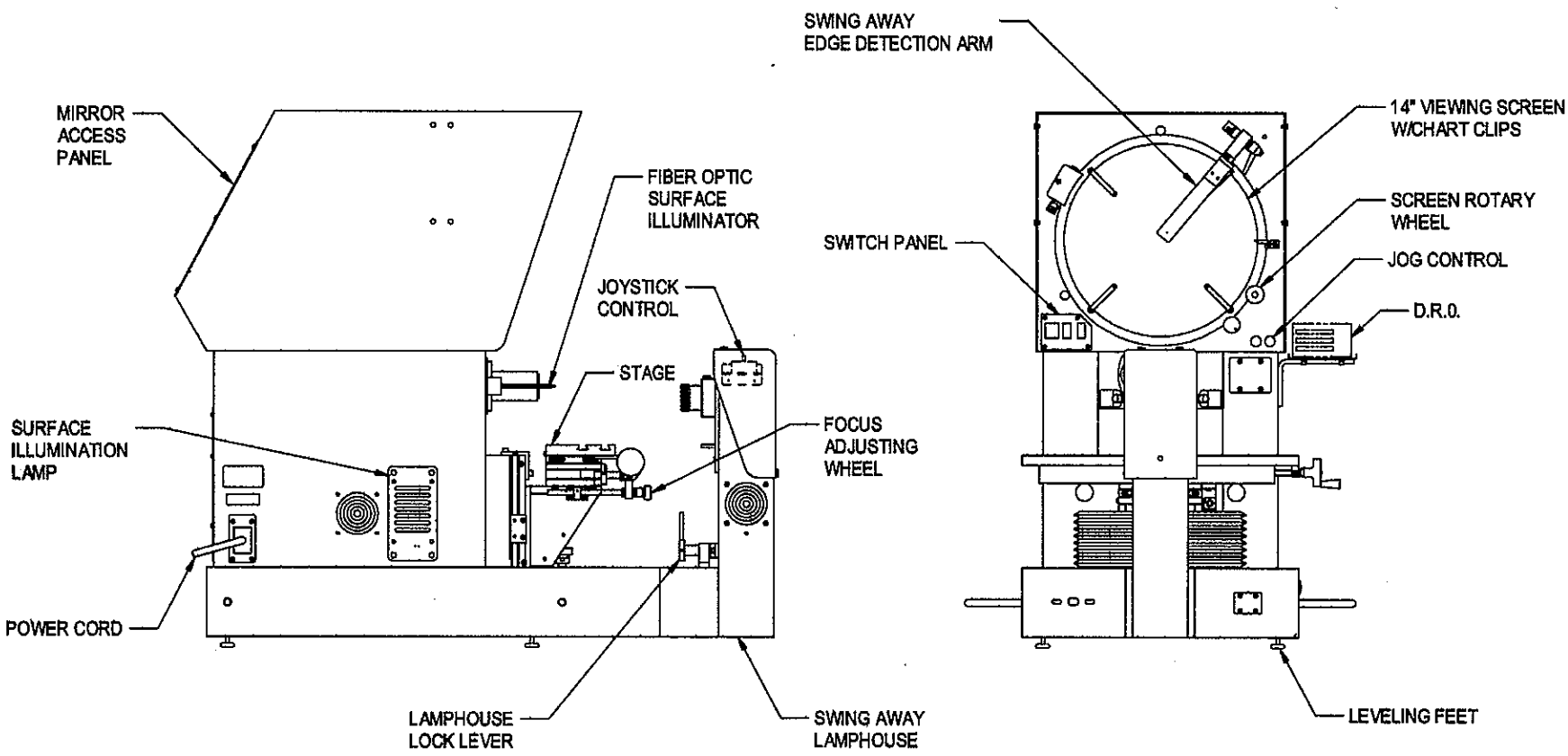
Magnification Lenses
5X, 10X, 20X, 31 ¼ X, 50X, 62 ½ X,100X, 250X

Electrical
Voltage.....100-240v, 50 or 60 Hz
Current.....3 amps
Lamps (Tungsten-Halogen)
Profile Illum.....150 watt, 24 volt
Surface Illum.....100 watt, 12 volt

Weight
Comparator..... 325 lb. (145 Kg)
Crated Comparator..... 356 lb. (160 Kg)



20 3700 SERIES
NOMENCLATURE

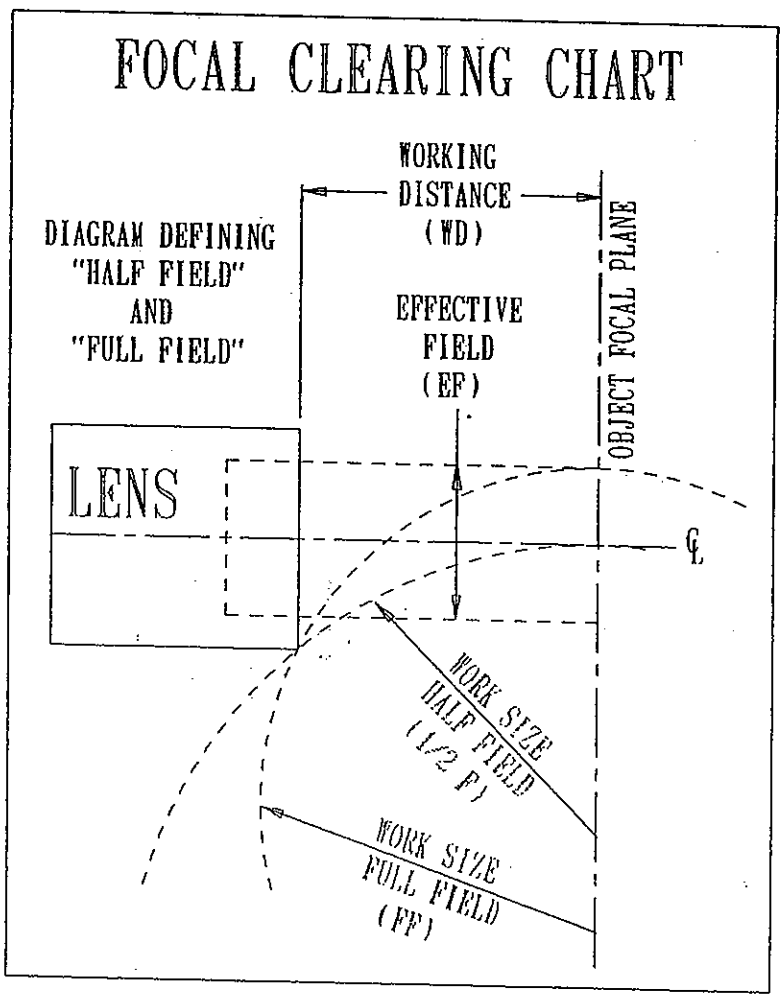


Focal Clearing Chart

14" OPTICAL COMPARATORS

MAG.	WD	EF	DIA 1/2F	DIA FF
5X	1.80"(46mm)	2.80"(71mm)	3.60"(91mm)	3.60"(91mm)
10X	2.70"(69mm)	1.40"(36mm)	8.30"(210mm)	6.00"(152mm)
20X	1.25"(32mm)	0.70"(18mm)	3.20"(81mm)	2.60"(66mm)
20X *	3.13"(80mm)	0.70"(18mm)	6.79"(172mm)	4.84"(122mm)
25X	2.75"(70mm)	0.56"(14mm)	5.14"(130mm)	4.07"(103mm)
31 1/4X	3.75"(95mm)	0.44"(11mm)	8.65"(219mm)	8.51"(216mm)
50X	2.50"(64mm)	0.28"(7mm)	9.20"(233mm)	8.40"(213mm)
62 1/2X **	1.67"(42mm)	0.22"(5mm)	4.83"(122mm)	4.36"(110mm)
62 1/2X	2.90"(74mm)	0.22"(5mm)	9.20"(233mm)	9.20"(233mm)
100X	1.00"(25mm)	0.14"(3mm)	3.20"(81mm)	2.80"(71mm)
250X	0.59"(15mm)	0.06"(1mm)	1.40"(35mm)	1.30"(33mm)

* SPECIAL 20X LENS WITH EXTRA LONG WORKING DISTANCE
** NEW MODEL 62 1/2X LENS (After 11/30/2001)



INSTALLATION SITE

The SCHERR-TUMICO 3700 is a precision optical instrument and should be installed in a clean, vibration free location. Dust, oil and other contaminants may coat the lenses and mirrors and cause distortion or otherwise reduce image quality. Extremes in temperature may cause excessive expansion or contraction of the comparator and parts to be measured resulting in inaccuracy of part measurement. High humidity may result in condensation and fogging of the mirror, lenses and screen. It is recommended to install the comparator in an air-conditioned room with a lower than normal light level.

SETUP

The SCHERR-TUMICO 3700 requires only minimal setup upon receipt. Avoid rough handling, which could cause misalignment and inaccuracy of measurement.

UNPACKING

IMPORTANT...If you have any questions about unpacking or setup, contact S-T Industries or local S-T distributor.

1. Remove cardboard cover from pallet. Remove plastic bag covering optical comparator. Unbolt boards holding comparator on pallet.

2. Pick up comparator by lifting handles with a fork lift. While still being held by the forklift, remove wood beams from under comparator and install leveling feet (4) under base of comparator. Place in position for operation and remove lifting handles.

3. Adjusting leveling feet until comparator is level and stable. Remove any additional packaging material from optical comparator.

4. Check for shipping damages. Document shortages and damages and report to S-T Industries including the Model number and Serial number.

5. Wipe down the comparator with clean dust rags. **CAUTION:** Do not use shop air hoses to blow dirt from the comparator. Flying particles can damage mirror surfaces or optics.

Do not connect power to the comparator until setup is complete

INSTALLATION

DRO INSTALLATION

1. Locate arm and tray or mounting bracket for digital readout on right side of comparator. Loosen clamps and rotate tray and arm until in desired position to support DRO. Tighten clamps to hold in position. **Do not over tighten.**

2. Locate Digital Readout. Place on tray. (If using DRO mounting bracket, follow instructions included with digital readout.) Unwrap cords on side of comparator and plug into digital readout. Plug cables marked X axis and Y axis into the X axis and Y axis connectors on the back of the digital readout. Plug the unmarked cable into the 'Q' or angle axis connector on the back of the digital readout. Plug in power cord to DRO. **CAUTION:** If you have the edge detection option, be careful not to over bend small fiber optic bundles.) Secure cables to arm with wire ties if necessary.

Note: If the comparator is configured with the QC 4215 DRO, there will be a different setup for the DRO tray. See section on CNC option.

STAGE SETUP

1. Remove shipping brackets from stage. Replace any screws and washers, which are, end stops for ballways.

2. If this unit has a motor drive or CNC option, locate joystick and install on joystick mount. Plug in joystick cable.

LENS INSTALLATION

1. Locate lens and remove and packaging and covers. Make sure both ends are clean. Do not blow or use shop air to clean lenses or remove dust. Use an air canister or lens cleaning cloth to clean lens surfaces of necessary.

2. Loosen thumbscrews and remove any cover from lens mounting hole. Insert flange of lens in mounting hole by aligning half-round cutouts to the thumbscrews. When the lens is fully seated in the mounting hole, rotate 90 degrees and lock in place with the thumbscrews.

3. This unit is equipped with a 2-lens turret. Repeat above steps for 2nd lens.

POWER UP

IMPORTANT- be sure power entry module voltage is set appropriately.
Insert main power cord into power entry module in the side of the comparator and plug into outlet. Turn on main power. Check fan and DRO operation. Turn on profile and surface illumination and check operation.

POWER SWITCHES

There are 3 switches locate on the right side of the comparator.

1. The main power switch controls all power to the lamps, fans and accessory cable.

2. The Profile Illumination switch controls power to the profile lamp.

3. The Surface Illumination switch controls power to the surface illumination lamps.

Note: The fans will operate when the main power switch is turned on.

PROFILE AND SURFACE ILLUMINATION

Profile and surface illumination each have their own light sources and respective ON-OFF switches.

The profile illuminator projects a light beam past a part on the stage into a lens, creating an accurately magnified image of the part profile on the screen when properly focused. This allows precise measurements of the features of a part either by comparison to a chart or by positional measurement using a digital readout.

The surface illuminator projects light through two fiber optic bundles onto the front surface of a part. The reflection can be seen on the screen and the image can be measured using the comparison or positional method. To adjust each fiber optic bundle, loosen the respective thumbscrews and position the bundle to obtain desired illumination and retighten thumbscrews. **CAUTION** Do not over tighten thumbscrews.

MAGNIFICATION LENSES

There are several optional lens magnifications available with the ST 3700 optical comparator.

20-0320-01	5X Magnification	20-0310-00	10X Magnification
20-0313-00	20X Magnification	20-0312-00	20X Magnification
20-0315-00	25X Magnification	20-0317-00	31 1/4X Magnification
20-0318-00	50X Magnification	20-0319-00	62 1/2X Magnification
20-0321-01	100X Magnification	20-0322-00	250X Magnification

The lenses that are ordered with the optical comparator will be installed and preset at the factory.

STAGE OPERATION

The horizontal axis (X) is controlled by a hand crank at the right of the top plate and a quick-release mechanism in front of the stage. Rotate the quick-release lever slightly to release, which will allow free movement of the top plate. Rotate the lever back to tighten the quick-release and then use the hand crank for fine adjust.

The vertical axis (Y) is controlled by a hand crank located to the left of the lamphouse. Rotate clockwise to raise the stage and rotate counter-clockwise to lower the stage.

The focus axis is controlled by a knob located to the lower right of the stage.

HELIX ADJUSTMENT

This feature aligns the light from the condenser lens to the helix angle of threads so they can be viewed correctly. Move the lever under the condenser lens until the image is clear on both sides of the thread. There is a detent to return the lever to the center position.

SWING-AWAY LAMPHOUSE

To accommodate long parts which must be measured straight on rather than along their length, the 3700 is equipped with a swing-away lamphouse. Loosen the large clamp screw located at the bottom of the lamphouse and gently swing the lamphouse to the right. Remove the joystick if necessary. It will be necessary to clamp the part firmly in a vise, V-block or other suitable fixture and to use surface illumination in order to make accurate measurements. To return the lamphouse to its normal position, swing the lamphouse gently back into the stop bracket and tighten the clamp screw.

LENS TURRET

The 3700 comes equipped with a 2 position lens turret. The lens turret will accept all 14" lenses in the 'Home' position. However, the 5X and the 31 ¼ X lenses cannot be rotated to the 'On-Deck' position. To change the current lens, push the turret lever right or left to bring the other lens to the 'Home' position. Be sure the ball stop at the bottom of the turret is firmly seated in the groove. Do not rotate the turret using the lenses. This will loosen the lenses and may also damage them.

OPTIONS

Fiber Optic Edge Detection Option

This option provides a fast, accurate means of measuring by sensing the edge of an image when it passes by a fiber optic probe on the optical comparator screen. In this way, X-Y coordinates can be automatically entered into geometric functions (Points, Circles, Lines, etc.). This is available with the QuadraChek 200 and 4000 series digital readouts. See catalog of price list for ordering information.

This option includes a swing-away arm, which holds the fiber optic sensor on the screen. It can be moved out of the way when not in use.

MOTORIZED OPTION

Joystick Control

The X and Y axes are driven by stepper motors and controlled with a 2-axis joystick. (See Nomenclature Figure) The joystick is mounted to the right side of the base. It can be easily removed and handheld if desired. To move the screen image, deflect the joystick in the desired direction. The more the joystick is deflected, the faster the image will move. Pressing and releasing the top button of the joystick will switch the speed switched to slow speed. Press again to return to normal speed. (The left button on the joystick base has the same function as the button on top of the joystick. The forward button on the joystick base has no function.)

Note: The buttons on the joystick may have different functions with the CNC option.

Jog Wheels

In addition to the joystick, there are individual jog wheels for precise control of the X and Y axis. These are located just to the lower right of the screen. By rotating these wheels, the stage can be very accurately positioned. The joystick will override the jog wheels if you attempt to use the jog wheels and the joystick at the same time.

IMPORTANT - The operation of the joystick and jog wheels has been programmed into the stepper amplifier control at the factory. The software and interface cable have been included for your use, should it ever be necessary to update or change these settings. Consult the factory before doing this.

CNC Control Option

The CNC control option provides automatic measurement by driving the part to be measured to preprogrammed positions and taking points either by fiber optic edge detection or by manually targeting the edge of the part with the crosshair. The CNC control option is available with the QuadraChek 4000 series digital readout. Consult your QuadraChek manual or contact your S-T representative for more information. See catalog of price list for ordering information. If this comparator is configured with the QC4215 PC digital readout (CNC or non-CNC), there will be a monitor and keyboard tray, which will be installed on the right side of the comparator.

PROTRACTOR SCREEN OPERATION

The screen is rotated by turning the screen control knob located at the lower right of the screen. The screen can be locked in place using the screen lock located just above the screen control knob. Angle readings are viewed on the digital readout. Consult DRO manual for operation.

Absolute Zero Setting

The following procedure may be necessary if the glass screen is replaced:

1. Rotate the screen so the horizontal line is approximately level.
2. Focus a pointer on the screen with its tip on the left end of the horizontal screen line.
3. Move the stage so the image of the point is on the right end of the screen.
4. Observe the space between the tip of the pointer and the horizontal screen line.
5. Move the stage so the tip moves closer to the line by one half of the observed space.
6. Rotate the screen so the horizontal line is on the tip of the pointer.
7. Move the stage so the image of the point is on the left edge of the screen.
8. Repeat steps 4-7, alternating sides, until the tip remains on the horizontal line.
9. Loosen the reference marker on the right side of the screen and align with horizontal line. Consult digital readout manual for establishing Zero set point.

ANGULAR MEASUREMENTS (WITH DIGITAL SCREEN PROTRACTOR)

Consult Digital Readout manual for information on Digital Protractor operation

Incremental Method

1. Secure part to stage.
2. Focus image and position as required.
3. Align a screen reference line with an edge or feature, which is a datum. Zero the incremental 'Q' or ANGLE axis display on DRO.
4. Rotate screen reference line to feature to be measured, align by moving stage if necessary and read angle on incremental 'Q' axis display.

Absolute Method

1. Focus image and position as required.
2. Align datum on part with reference line on screen. Secure part to stage.
3. Rotate screen reference line to feature to be measured, align by moving stage if necessary and read angle on absolute 'Q' axis display.

MEASURING TECHNIQUES

The optical comparator has 2 basic measuring means. Direct Optical Comparison and Measured Linear Displacement.

If necessary, secure parts to stage top. Do not attempt to get accurate measurements unless parts are stable. S-T Industries offers several standard stage fixtures and builds special fixtures for unusual parts according to customer specifications. Contact S-T Industries sales department for information.

Direct Optical Comparison

Precise measurements can be made by comparing accurately magnified images to scaled drawings or shapes superimposed or overlaid on the image.
Irregular contours, angles, radii, tapers, etc., together with high quantity measurements get compared best by use with master charts.

Three ways of chart preparation

1. To-scale part or feature drawings. Hand or CAD produced drawings on Mylar to a scale matching the lens magnification. Be sure lines are thin; .005"-.010" for best comparison accuracy.
2. Hand traced master. Focus a part or feature on the screen at the desired magnification. Use the chart clips or tape to secure a sheet of Mylar or drafting film to the surface of the screen. Using a fine point lead pencil, trace the profile. Care must be taken not to rotate the screen or move the part while tracing. Protect pencil lines by spraying a thin coat of a clear fixative.
3. Custom and standard overlay charts. S-T Industries, Inc. can supply precision overlay charts made to order as well as a full line of standard charts.

Charts can be held in place using the chart clips attached to the glass screen.

Measured Linear Displacement

The standard measuring stage allows accurate linear measurements in 2 axes, X and Y. The X-axis travel is 12" (300 mm) and the Y-axis travel is 6" (150 mm). The stage is equipped with .00005"/.001mm resolution glass scale encoders and one of several available digital readouts.

Procedure

1. Secure the part to the stage and focus area to be measured.
2. Be sure that screen is set at 0° and align first edge to be measured with either the vertical or horizontal screen line.
3. Zero the appropriate axis on the digital readout.
4. Move the stage until the second edge to be measured aligns with the same screen line.
5. Read the linear measurement in the digital readout.

This method can be greatly enhanced with the use of QuadraChek Geometric Digital Readouts.

The X and Y display value or coordinate is used to directly calculate geometric features such as points, lines, circles, distances and angles. Also, fiber optic edge detection and CNC control add speed, accuracy and reliability to these measurements.

DIGITAL READOUT SYSTEMS

The 3700 series 14" optical comparator comes with several optional digital readout systems:

#20-3700-01 14" optical comparator with standard digital readout system. S-T's model 20-7000 DRO features X, Y and angle axis. Also includes INCH/MM, INC/ABS and PRINT features.

#20-3700-02 14" optical comparator with QuadraChek 221 geometric digital readout system. DRO has all standard features plus geometric calculations including point, line, circle, distance, angle and skew and programmability.

#20-3700-03 14" optical comparator with QuadraChek 221E geometric digital readout system. DRO has all features of above system plus fiber optic edge detection.

#20-3700-05 14" optical comparator with QuadraChek 4215 computerized geometric digital readout system. DRO has all features of above system and includes PC computer with latest WINDOWS® based QC 4215 software. Includes graphic representation of part features, mouse controlled commands, CAD-like graphical user interface and unlimited programmability.

CALIBRATION

Magnification

The screen magnification can be calibrated by using S-T Industries' 74-0413-10 Master Ball Checker and 74-0321-10 10" magnification scale.

1. Locate appropriate ball for lens to be checked. (Scale is marked with diameters and magnifications)
2. Focus ball in center of screen.
3. Using magnification scale, check size of image left to right.
4. Repeat check top to bottom.
5. Edge of image should ideally split lines on checking scale. This may vary from the inside of both lines to the outside of both lines.
6. Record the results and move the image to the upper right corner of the screen. Repeat the check.
7. Move to the remaining three corners of the screen and repeat check for all. If the magnification is incorrect, the mirror may need adjustment.

NOTE: It may be determined that the mirror is correct and that a lens needs adjustment.

For assistance in these procedures, contact S-T Industries, Inc. or your local S-T distributor.

CAUTION

Do not disassemble a lens system to adjust or clean internal glass surfaces. Assembly and calibration of these systems requires special alignment equipment and procedures. Notify your S-T representative if you have a lens problem.

Measuring Stage

The measuring stage linear accuracy can be calibrated by using S-T Industries' 74-0500-00 calibration plate.

1. Place the calibration plate on the stage so the longer side is parallel with the X-axis.
2. Focus on the 6" or 150mm scale.
3. Be sure that the screen is set to 0^{o}.
4. Move the stage back and forth to see that the scale line stays on the crosshair. Adjust the calibration plate if necessary.
5. Align the '0' end of the calibration scale with the screen crosshair.
6. Zero the X-axis display on the DRO and move the stage until the other end of the scale aligns with the crosshair.
7. The X-axis display should read the same as the scale length; 6.00000" or 150.000mm. If it does not, consult your DRO manual and adjust LEC (Linear Error Correction) until the reading is correct.
8. Return to the '0' end of the scale, zero the X-axis display, if necessary, and move to the next increment on the scale (1.0" or 10mm). Record the value and repeat for each increment. Without moving the stage, carefully slide the calibration plate until the '0' line is aligned with the vertical screen line. Continue measuring to end of travel (X axis only).
9. For Y-axis, move top plate to center position. Stand stage calibration plate on end. Follow steps 4-8 using the Y-axis.

The measuring stage squareness can be calibrated by using S-T Industries' 74-0500-00 calibration plate.

1. Place the calibration plate on the stage so the longer side is parallel with the X-axis.
2. Focus on the 6" or 150mm scale.
3. Be sure that the screen is set to 0^{o}.
4. Move the stage back and forth to see that the scale line stays on the crosshair. Adjust the calibration plate if necessary.
5. Move the stage until the end of the vertical axis of the calibration plate is aligned with the screen crosshair.
6. Zero the X and Y-axis displays on the DRO.
7. Move the stage in the Y direction only until you reach the end of the scale or the end of stage travel. If the line has moved away from the crosshair in the X direction, move the stage until it lines up again.
8. The squareness is the deviation of the X-axis divided by the length of travel along the Y-axis.

For assistance in this procedure contact S-T Industries, Inc. or your local S-T distributor.

MAINTENANCE

Care and cleaning of the Optical System

External Lens Cleaning

1. Remove all dust from external glass surfaces. Use a clean, soft brush (preferably a lens brush sold in camera stores) or clean cotton to avoid scratching. Turn the cotton each stroke to keep wiped dust particles from the lens.

2. With the dust removed use mild glass cleaner and clean absorbent cotton to clean the lens surface.

CAUTION
Never immerse a lens system in any cleaning solution. Moisten the cotton with the glass cleaner slightly; not soaking wet.

Mirror Cleaning

Remove glass screen to access mirrors.

Remove dust from mirror with a brush, described previously. If necessary, use a clean cotton cloth and a mild glass cleaner for more thorough cleaning. Wipe gently in straight-line motion across the mirror surface, turning the cotton with each pass across the mirror. Due to the delicate nature of the mirror coating, try to keep mirror cleaning to a minimum.

Projection Screen

Clean the projection screen with a mild glass cleaner. Use a clean, soft cloth. Do not use paper towels as they may contain abrasives.

Fuse Protection

A 3-amp fuse (2 amp for 220-240 volt) protects all electric circuits in the 20-3700 optical comparator. The fuse is located in the power input module located at the left rear of the comparator. To change, remove the power cord from the power entry module and, using your finger, unsnap the fuse drawer and pull out. Change fuse and replace fuse drawer.

Lamp Replacement

When a lamp fails, wait 5 minutes before replacing to allow fans to cool off lamp area. After this time turn off main power and disconnect main power cord.

Profile Lamp (Part No. 48-7271-00)

1. Remove cover of profile lamphouse. Remove heat baffle covering lamp.
2. Slide lamp up from the socket. Be careful, the lamp may still be hot.
3. Install a new lamp into the socket using a clean cloth or gloves to keep from touching the lamp. Rock slightly to seat in the socket and center the filament to the optics as close as possible.
4. Check cooling fan on left side of lamphouse and clean if necessary.
5. Replace baffle and top cover.
6. Reconnect power cord and check lamp operation.

Surface Illumination Lamp (Part No. 48-7747-00)

1. To access the lamp, remove left panel.
2. To remove lamp, pull on ejector lever. Ease the lamp out of the socket into a cloth or glove. Be careful, the lamp may still be hot.
3. Slide the new lamp into the socket. Keep the front face of the lamp reflector parallel against the bracket front. Center the lamp front on the bracket opening.
4. Check the cooling fan and clean if necessary.
5. Replace cover panel.
6. Reconnect power cord and check lamp operation.

Lubrication

Lubricate ballways and ball bearings of measuring stage with light oil occasionally, to prevent corrosion and keep motion smooth. Use a light grease preferably with Teflon® to lubricate leadsrews.

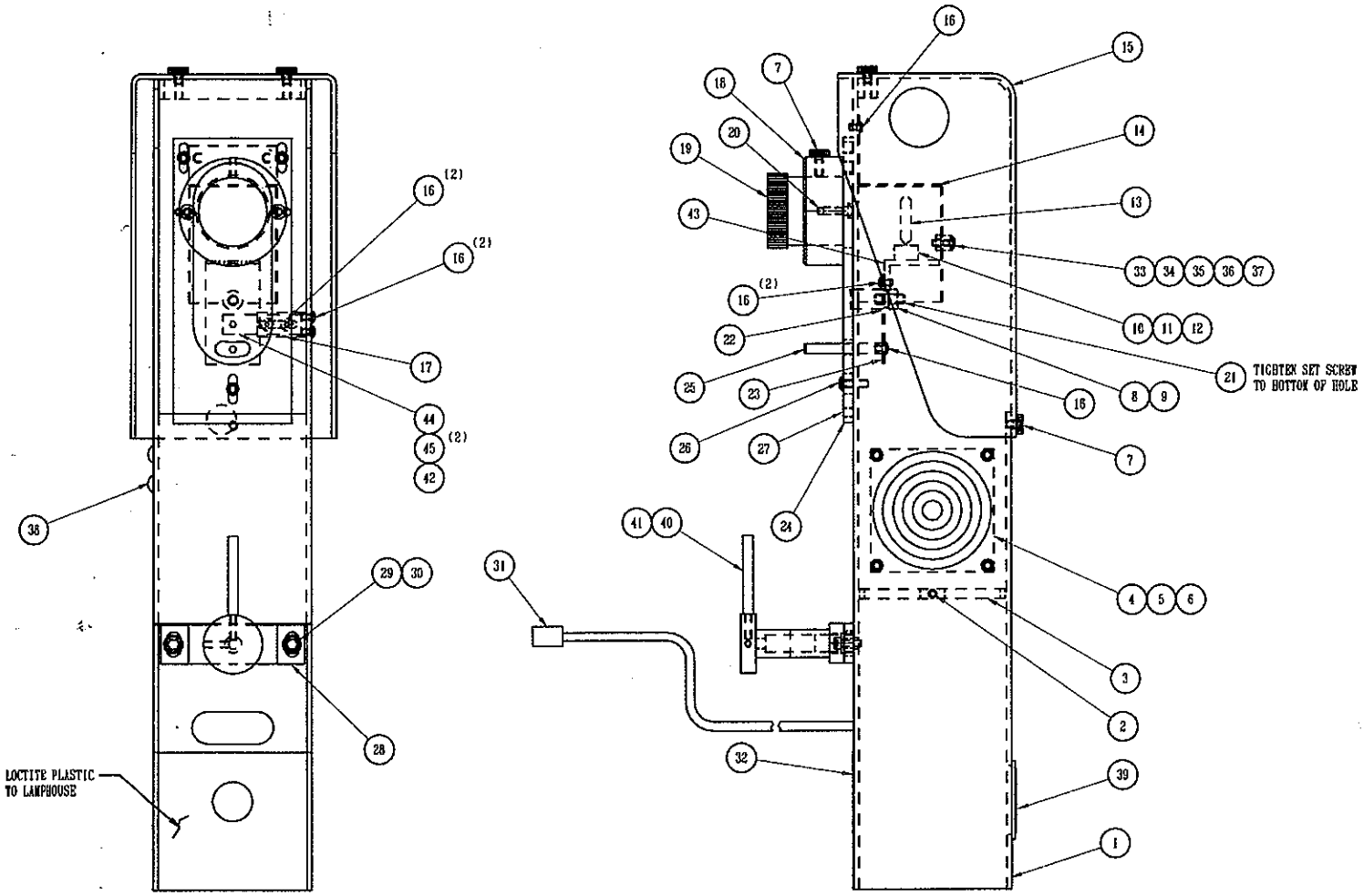
Parts Identification

Compare the part numbers on sub-assembly and part illustrations with their respective parts lists to identify parts.

Parts Ordering

1. Furnish the comparator model and serial number
2. State the part number, description and quantity of each part required.
3. State shipping instructions.

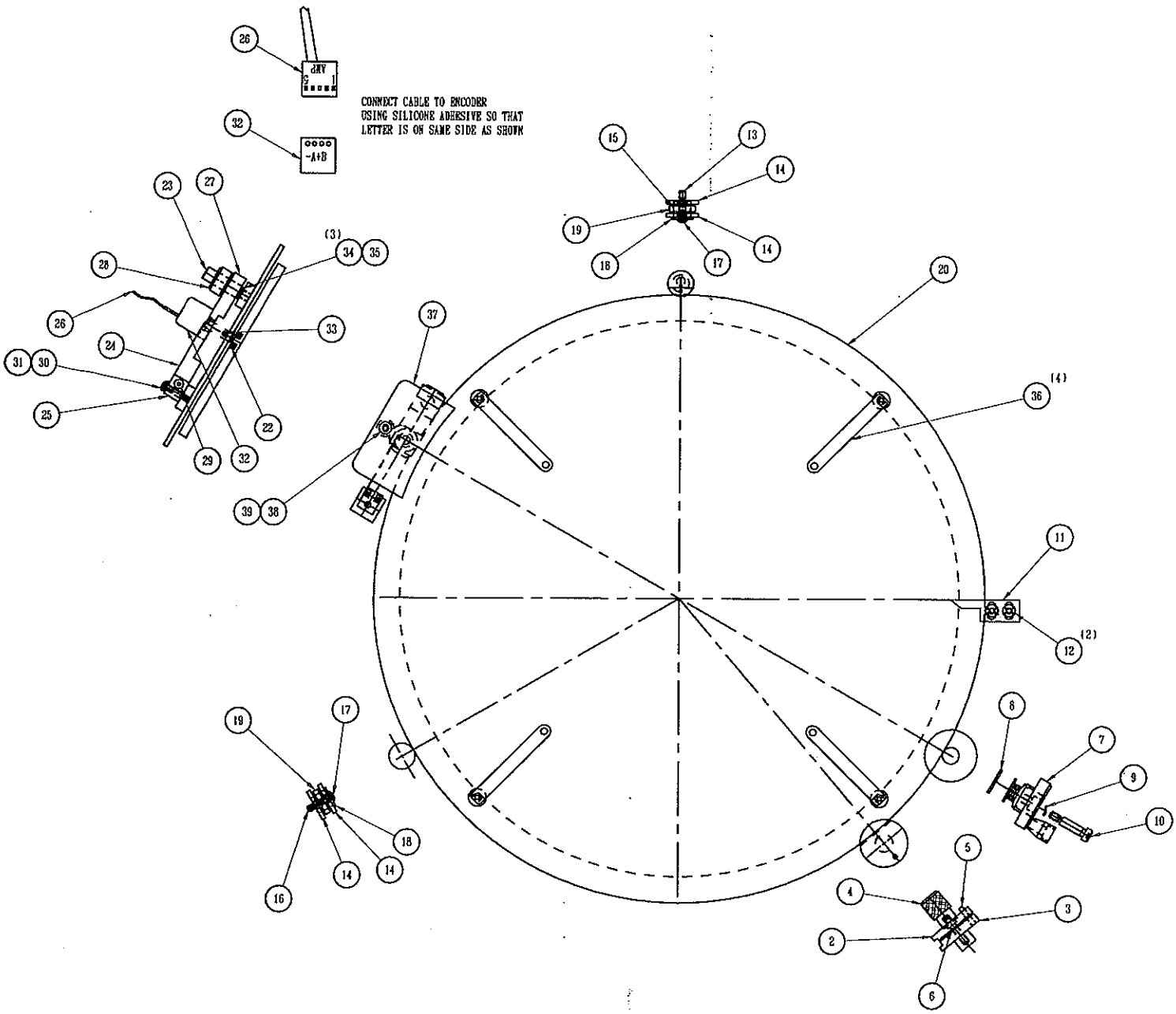
LAMPHOUSE ASSY.



2	45	48 5036	HEX NUT
1	44	22 4133-17	SPRING
1	43	22 4133-15	SOCKET MOUNT-BULB COVER
1	42	22 4133-18	SET SCREW
1	41	48 8189	HANDLE
1	40	48 6035	WASHER
1	39	22 4019-00	HOLE PLUG, PAINTED
2	38	48 7019-09	HOLE PLUG
1	37	22 4028-06	FIBER OPTIC MOUNT
1	36	48 5797	WASHER
1	35	48 7791	SCREW, BHCS 8-32 X 1 1/4 LG.
1	34	48 5196	HEX NUT, 8-32
1	33	48 5339	SCREW, BHCS 4-40 X 1/4 LG.
1	32	22 4028-04	PLASTIC SPACER
1	31	22 4028-03	WIRE CABLE ASSY.
2	30	48 6083	WASHER
2	29	48 5297	SCREW, SHCS 10-32 X 1/2 LG.
1	28	22 4133-10	LOCK BAR
3	27	48 7356	SOC SET SCREW 1/4-20 X 1/4 LG.
3	26	48 5622	SCREW, BHCS 10-32 X 5/8 LG.
1	25	22 4133-09	PIVOT HANDLE
1	24	22 4133-03	COND. LENS PLATE & PIVOT PIN ASSY.
1	23	22 4133-13	SOCKET MOUNT - BULB
2	22	22 3326-0088	WASHER, TEFLON
1	21	48 5619	SOC SET SCREW 1/4-20 X 3/4 LG.
2	20	48 5358	SCREW, BHCS 10-32 X 3/8 LG.
1	19	22 3726-00	LENS
1	18	22 4133-11	LENS HOLDER
1	17	22 4133-16	SPRING BLOCK
9	16	48 5111	SCREW, BHCS 8-32 X 1/4 LG.
1	15	22 4133-06	LAMPHOUSE COVER
1	14	22 4133-19	BULB COVER (SANDBLASTED)
1	13	48 7271	BULB
1	12	22 4108-00	LAMP SOCKET
2	11	48 5319	SCREW, SHCS 6-32 X 1/2 LG.
2	10	48 7991	SPACER
1	9	48 6738	WAVE WASHER
1	8	48 6044	ELASTIC STOP NUT 1/4-20
4	7	22 2107-19	THUMB SCREW
4	6	48 6479	SCREW, BHCS 10-32 X 1/2 LG.
1	5	48 6778	FAN GUARD
1	4	22 3426	FAN
1	3	22 4133-12	GUSSET PLATE
2	2	48 5438	SCREW, BHCS 8-32 X 3/8 LG.
1	1	22 4133-01	LAMPHOUSE & COVER STRAP
QTY.	ITEM	PART NO.	DESCRIPTION

LIST OF MATERIALS

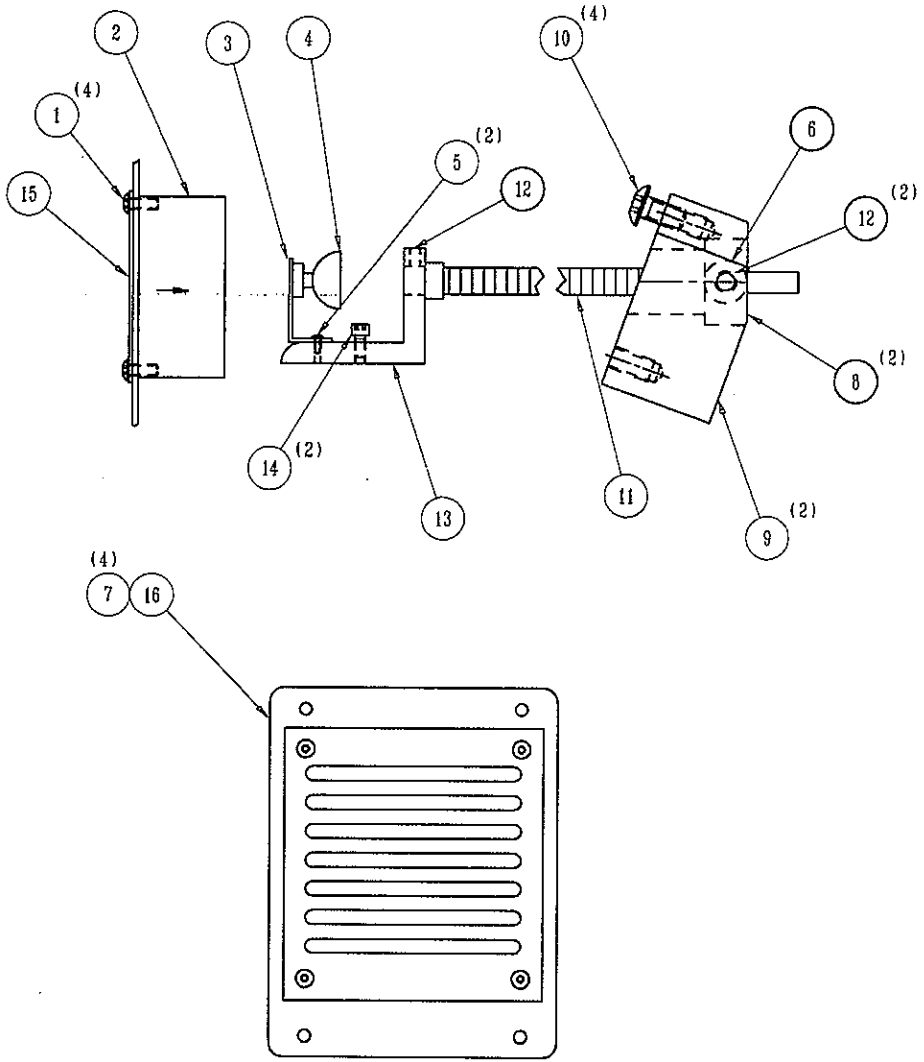
SCREEN ASSY.


CONNECT CABLE TO ENCODER
USING SILICONE ADHESIVE SO THAT
LETTER IS ON SAME SIDE AS SHOWN
-A+B
(3)
(4)
(2)

SCREEN ASSY.

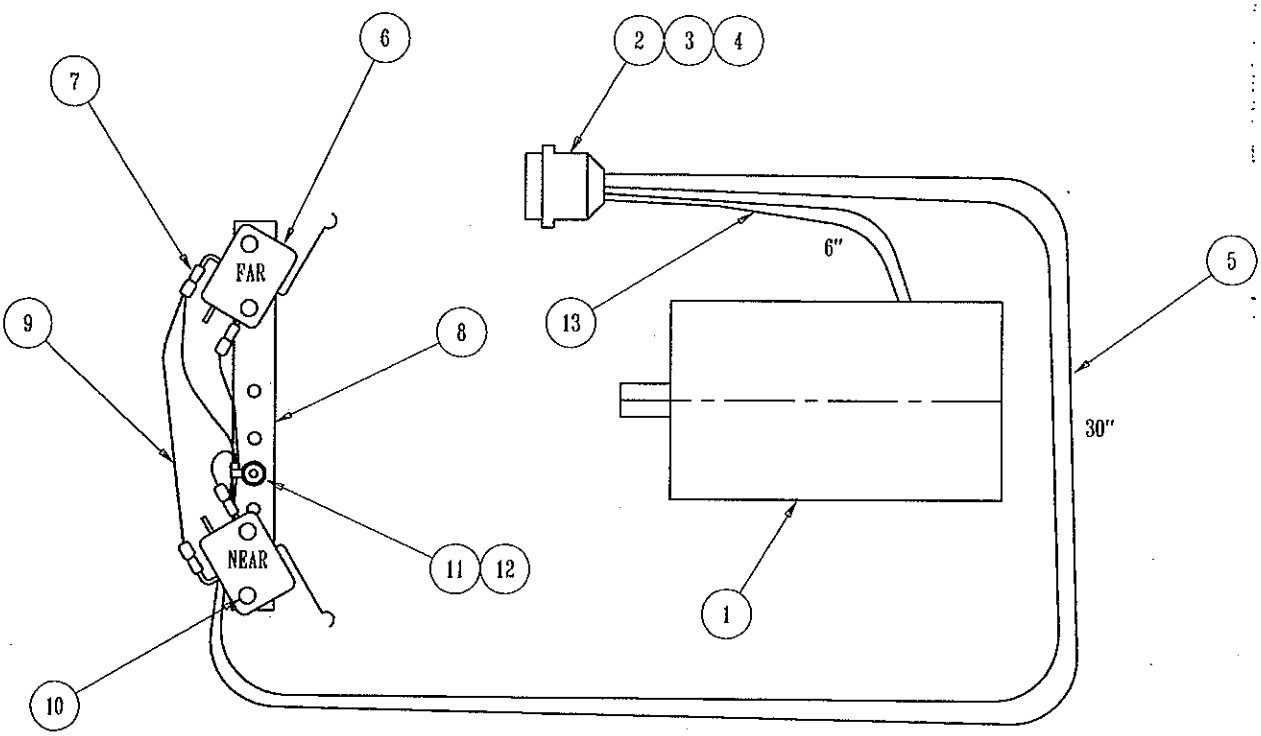
QTY.	ITEM	PART NO.	DESCRIPTION
1	39	48 6525	SCREW BHCS 10-24 X 5/8 LG.
1	38	22 4035-04	SPACER
1	37	22 4035-03	ENCODER WHEEL COVER
4	36	22 3952-09	SCREEN CLIP
1	35	48 6737	WAVE WASHER
3	34	48 6070	NYLON WASHER
1	33	48 5813	SET SCREW 4-40 X 1/8 LG.
1	32	48 7692	ENCODER
1	31	48 6654	WASHER, SPRING LOCK
1	30	48 5185	SCREW, BHCS 8-32 X 3/4 LG.
1	29	48 5137	SCREW, BHCS 6-32 X 1/4 LG.
1	28	48 5125	COLLAR, SET SCREW
1	27	22 3711-02	PIVOT ARM
1	26	22 3723-03	CABLE ASSY. ENCODER
1	25	22 3711-07	TENSION BLOCK
1	24	22 3711-08	TENSION SPRING
1	23	22 3711-06	PIVOT SHAFT
1	22	22 3711-26	ENCODER WHEEL
	21		
1	20	74 0008-1525	16" GLASS SCREEN
2	19	48 8003	BEARING
2	18	48 6083	WASHER
2	17	48 5111	SCREW, BHCS 8-32 X 1/4 LG.
1	16	22 3711-29	THREADED PIVOT STUB 1/2"
1	15	22 3711-31	BUSHING, ECCENTRIC
4	14	22 3711-30	CAP
1	13	22 3711-28	THREADED PIVOT STUD 1/4"
2	12	48 6560	SCREW, BHCS 10-24 X 1/4 LG.
1	11	22 3941-10	SCREEN POINTER
1	10	48 5598	SHOULDER SCREW 1/4 X 3/4 LG.
1	9	48 8004	WAVE WASHER
1	8	48 5521	WASHER
1	7	22 4035-01	DRIVE KNOB & ROLLER ASSY.
1	6	48 7604	SPRING
1	5	48 5153	DOWEL PIN 1/8 X 5/8 LG.
1	4	22 3941-08	LOCK SCREW, SCREEN ASSY.
1	3	22 3941-06	TOP SCREEN LOCK
1	2	22 3941-05	BOTTOM SCREEN LOCK
	1		

FIBER OPTIC MOUNT ASSY.



QTY.	ITEM	PART NO.	DESCRIPTION
LIST OF MATERIALS			
1	16	22 4038-00	SURF. ILLUM. DOOR ASSY.
1	15	48 6778	FAN GUARD
2	14	48 5007	SCREW, SHCS 10-32 X 3/8 LG.
1	13	22 3952-02	SOCKET MOUNT
1	12	48 5068	SOC SET SCREW 10-32 X 1/4 LG.
1	11	48 7430	FIBER OPTIC BUNDLE
4	10	48 5358	SCREW, BHCS 10-32 X 3/8 LG.
2	9	22 4134-01	FIBER OPTIC MOUNT
2	8	22 3952-03	STOP BUSHING
4	7	48 5106	SCREW, BHCS 10-32 X 1/4 LG.
2	6	22 2107-21	THUMB SCREW
2	5	48 5339	SCREW, BHCS 4-40 X 1/4 LG.
1	4	48 7747	PROJ. LAMP 100W/12V
1	3	22 3714-34	SOCKET ASSY. SURFACE ILLUM.
1	2	22 3426	TAPPED FAN ASSY.
4	1	48 6479	SCREW, BHCS 10-32 X 1/2 LG.

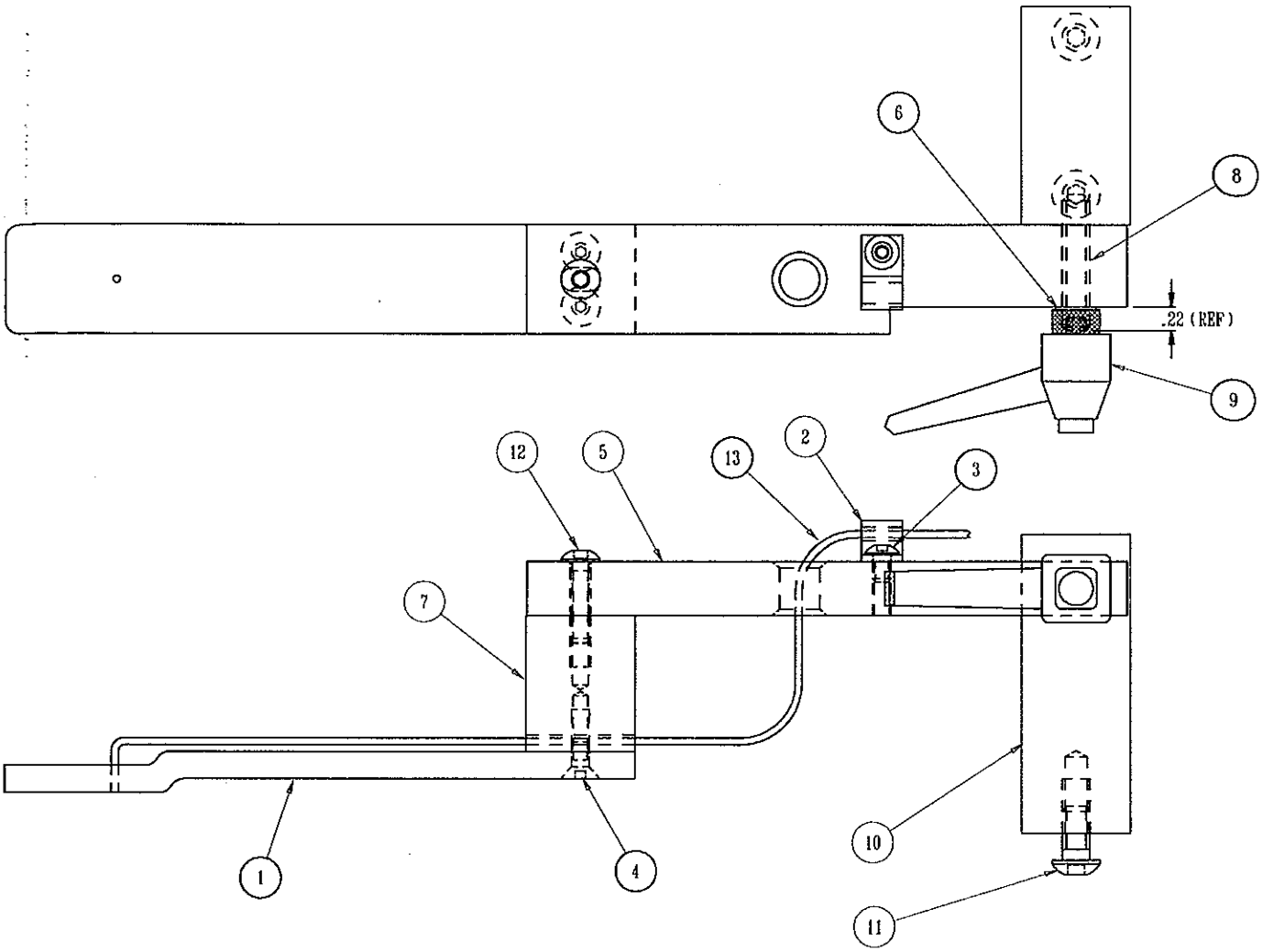
VERTICAL MOTOR DRIVE



QTY.	ITEM	PART NO.	DESCRIPTION
5"	13	48 5660	HEAT SHRINK
1	12	48 5438	SCREW, BHCS 8-32 X 3/8 LG.
1	11	48 5791	WIRE TIE WITH EYELET
4	10	48 5623	SCREW, BHCS 4-40 X 1/2 LG.
4"	9	48 7416	BLACK WIRE #22
1	8	22 4138-04	BRACKET, LIMIT SWITCH
4	7	48 7994	QUICK CONNECT TERMINAL
2	6	48 8044	LIMIT SWITCH
30"	5	48 7761	CABLE, 4 WIRE
1	4	48 8079	DB LONG HARDWARE
1	3	48 7659	DB9 HOUSING
1	2	48 7658	DB9P CONNECTOR
1	1	48 8078	STEPPER MOTOR, VERTICAL

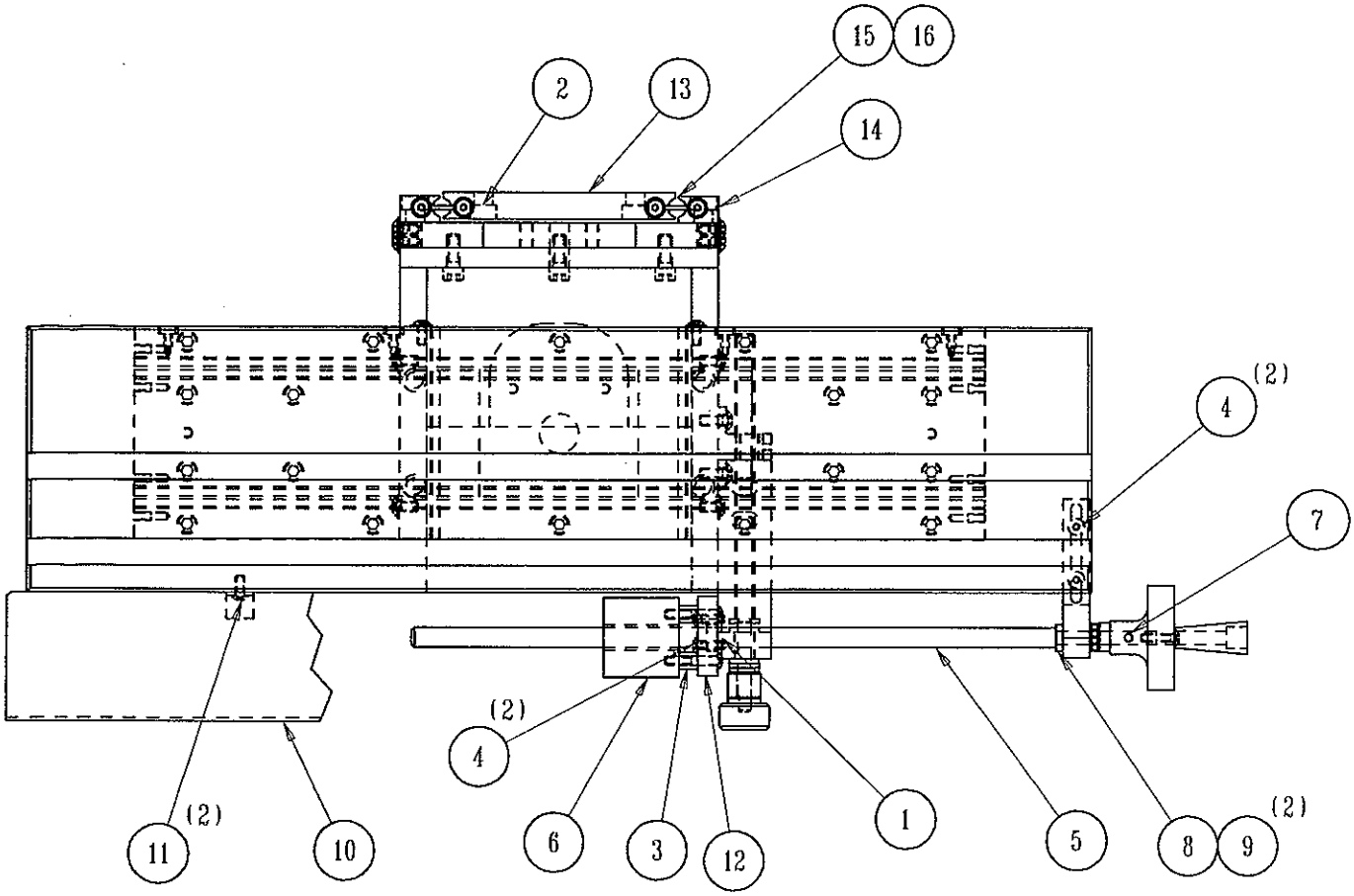
LIST OF MATERIALS

OPTIC MOUNT ARM ASSY.
22 4041-06



REF	13	48 7785	FIBER OPTIC CABLE
1	12	48 6684	SCREW, BHCS 10-24 X 3/4 LG.
2	11	48 6425	SCREW, BHCS 1/4-20 X 1/2 LG.
1	10	22 4041-05	RISER BLOCK
1	9	48 8299	HANDLE
1	8	48 5663	SET SCREW 1/4-20 X 1 1/4 LG.
1	7	22 3757-03	SPACER
1	6	48 6630	WASHER, WAVE
1	5	22 4041-07	SWIVEL ARM
2	4	48 5382	SCREW, FHCS 8-32 X 3/8 LG.
1	3	48 5111	SCREW, BHCS 8-32 X 1/4 LG.
1	2	48 7352	CLAMP
1	1	22 3747-05	MOUNT, PLASTIC
QTY.	ITEM	PART NO.	DESCRIPTION
LIST OF MATERIALS			

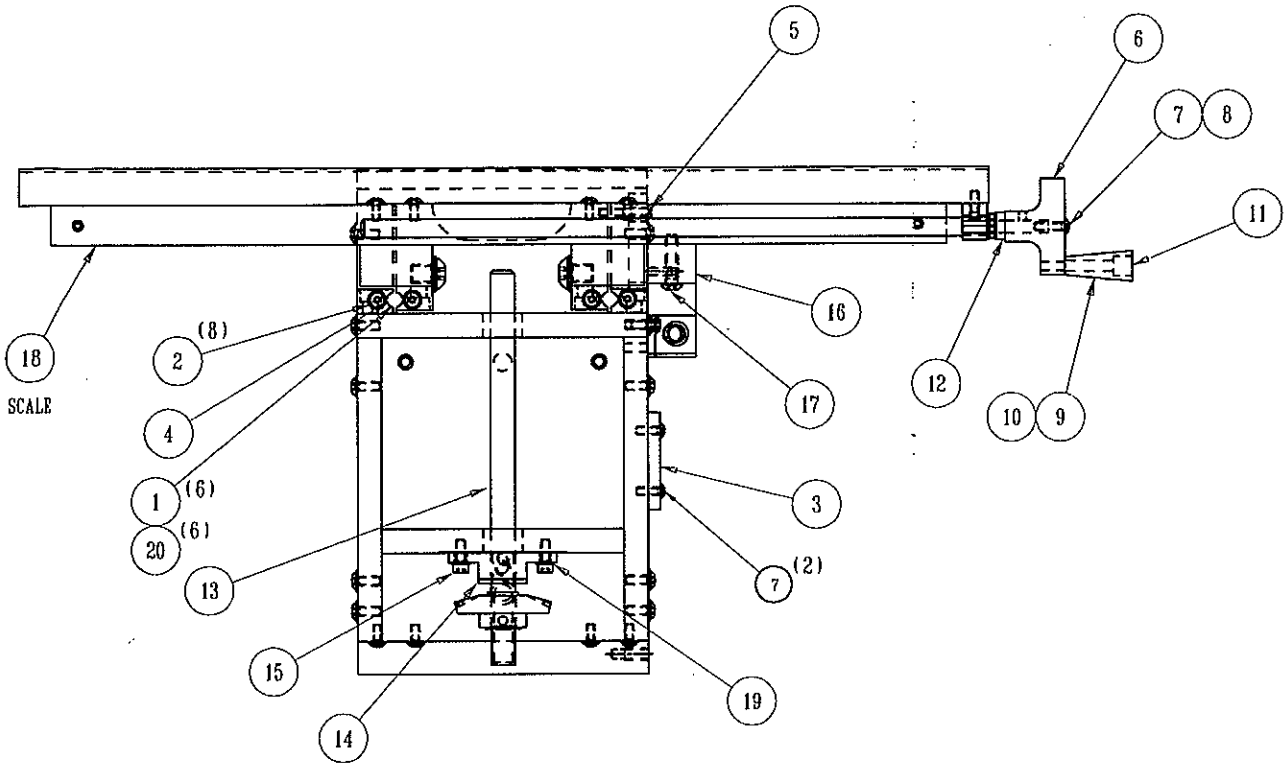
STAGE ASSY. TOP VIEW



QTY.	ITEM	PART NO.	DESCRIPTION
16	16	48 7679	BALL 5/16 DIA.
2	15	22 4129-0488	BALL RETAINER
2	14	22 3691-00	VERTICAL GIB
1	13	22 3695-00	VERTICAL SLIDE PLATE
1	12	22 3712-53	MOUNT, QUICK RELEASE NUT
2	11	48 5111	SCREW. BHCS 8-32 X 1/4 LG.
1	10	22 3712-59	COVER ASSY.
2	9	48 7646	THRUST BEARING
1	8	48 7437	FLANGE BEARING
1	7	48 5340	SET SCREW 10-24 X 3/16 LG.
1	6	22 3844-00	QUICK RELEASE NUT
1	5	22 3759-6888	"X" AXIS LEAD SCREW
4	4	48 5126	SCREW, BHCS 8-32 X 1/2 LG.
2	3	22 3891	SPACER
REF	2	48 5057	SCREW, SHCS 1/4-20 X 3/4 LG.
1	1	22 3844-12	FLANGE BEARING

LIST OF MATERIALS

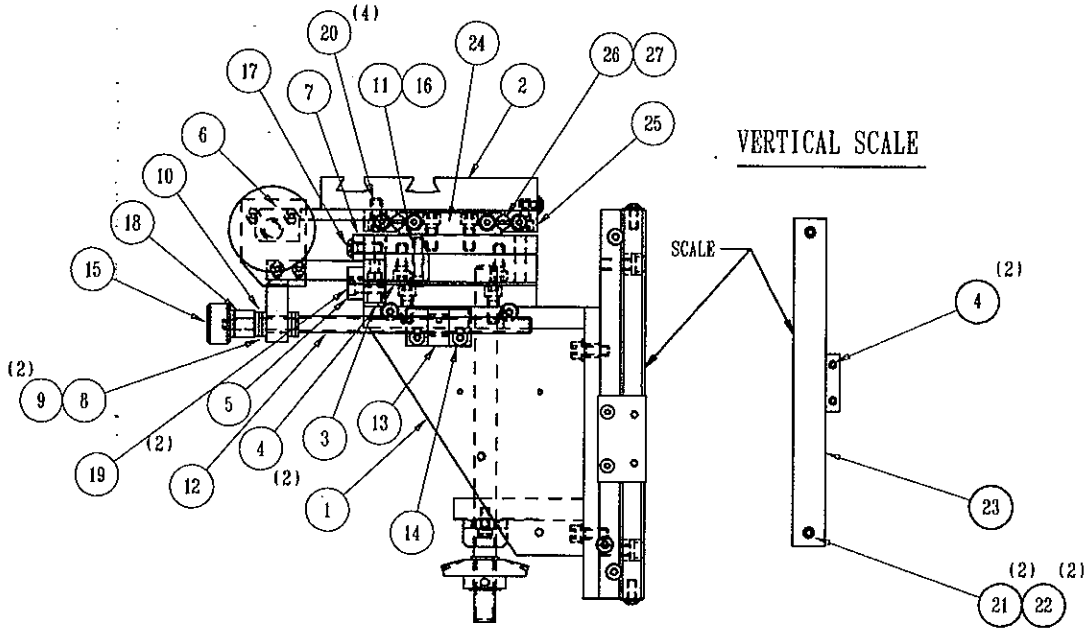
STAGE ASSY. FRONT VIEW



QTY.	ITEM	PART NO.	DESCRIPTION
6	20	48 5438	SCREW, BHCS 8-32 X 3/8 LG.
2	19	48 5032	WASHER
1	18	48 7796	12" 1um SCALE
2	17	48 7399	SCREW, BHCS 1/4-20 X 1" LG.
1	16	22 3712-15	FOCUS MOUNT ASSY.
2	15	48 5297	SCREW, SHCS 10-32 X 1/2 LG.
1	14	22 3724-51	VERTICAL NUT
1	13	22 4129-05	VERTICAL SCREW & NYLON GEAR
1	12	48 6630	WAVE WASHER
1	11	48 5131	SHOULDER SCREW
1	10	48 6135	WASHER
1	9	22 1007	HANDLE
1	8	48 6083	WASHER
3	7	48 5185	SCREW, BHCS 8-32 X 3/4 LG.
1	6	22 3687	KNOB
2	5	48 8055	SCREW, BHCS 8-32 X 1" LG.
2	4	22 3712-1288	BALL RETAINER FOCUS
1	3	22 4129-03	BRACKET VERTICAL READER HEAD
6	2	48 7693	WASHER
8	1	48 7679	BALL 5/16 DIA.

LIST OF MATERIALS

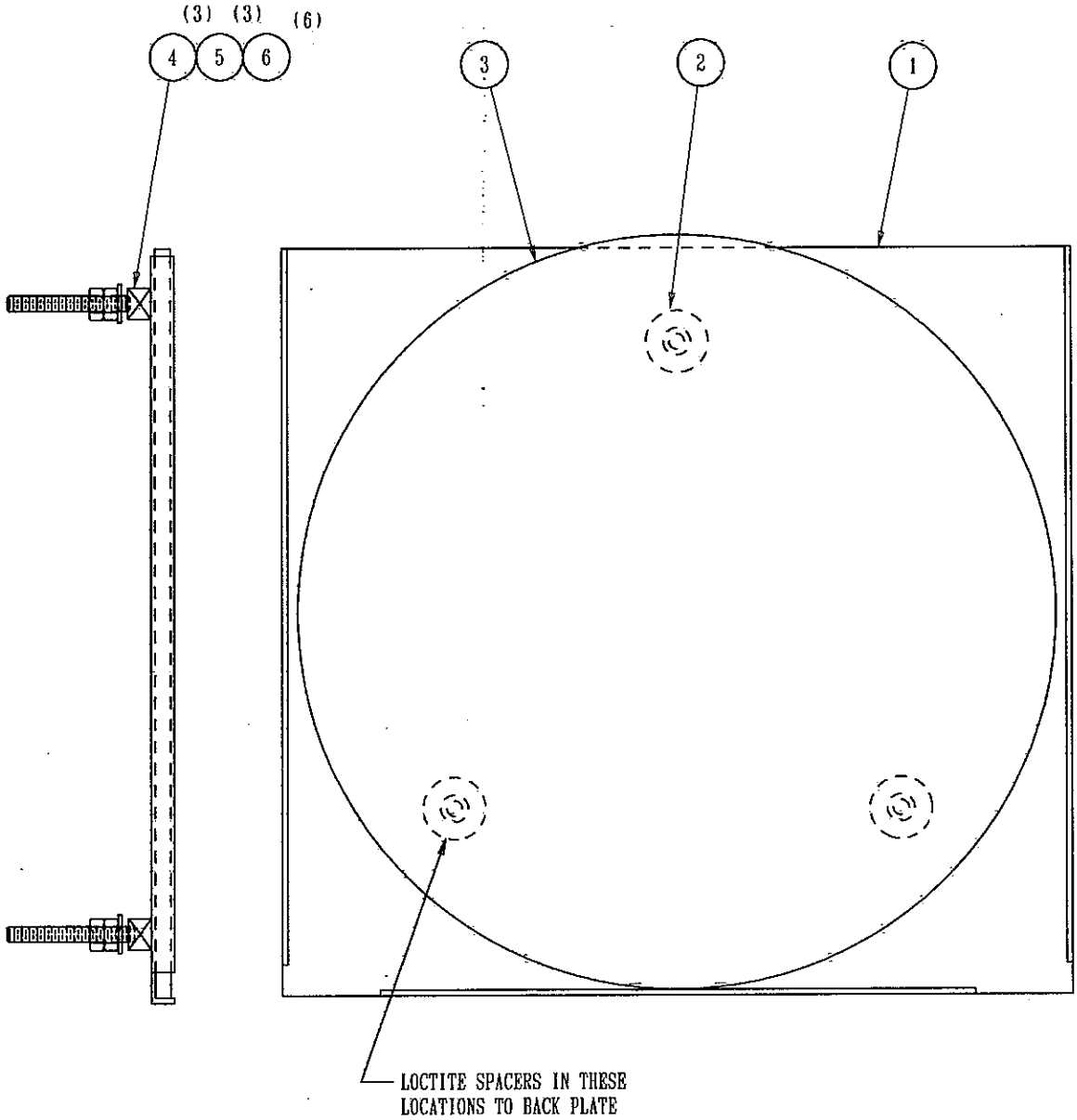
STAGE ASSY. SIDE VIEW



QTY.	ITEM	PART NO.	DESCRIPTION
16	27	48 7679	BALL 5/16 DIA.
2	26	22 3807-0088	BALL RETAINER
2	25	22 3796-00	HORIZONTAL GIB
1	24	22 3797-00	CENTER PLATE
1	23	48 8026	SCALE 5"
2	22	48 8000	WASHER
2	21	48 8152	SCREW, SHCS 1/4-20 X 7/8 LG.
4	20	48 5438	SCREW, BHCS 8-32 X 3/8 LG.
2	19	48 5161	SCREW, SHCS 8-32 X 3/8 LG.
1	18	22 3712-34	EXTENSION
2	17	22 3712-33	SCREW, BHCS 1/4-20 X .68 LG.
2	16	48 5709	WASHER
1	15	48 7790	KNOB, FOCUS
2	14	48 6479	SCREW, BHCS 10-32 X 1/2 LG.
1	13	22 3712-30	FOCUS BLOCK ASSY.
1	12	22 3712-18	FOCUS SCREW
2	11	48 7399	SCREW, BHCS 1/4-20 X 1" LG.
1	10	48 6630	WAVE WASHER
2	9	48 7646	THRUST BEARING
1	8	48 7437	FLANGE BEARING
2	7	22 3712-22	BRACKET, HORIZONTAL SCALE
1	6	22 3712-24	BRACKET, HORIZONTAL BEARING
1	5	22 3712-23	BRACKET, HORIZONTAL READER FRONT
6	4	48 5157	SCREW, SHCS 8-32 X 5/8 LG.
1	3	22 3712-20	BRACKET, HORIZONTAL READER REAR
1	2	22 3798-00	TOP PLATE
1	1	22 4129-01	STAGE MOUNT SUB ASSY.

LIST OF MATERIALS

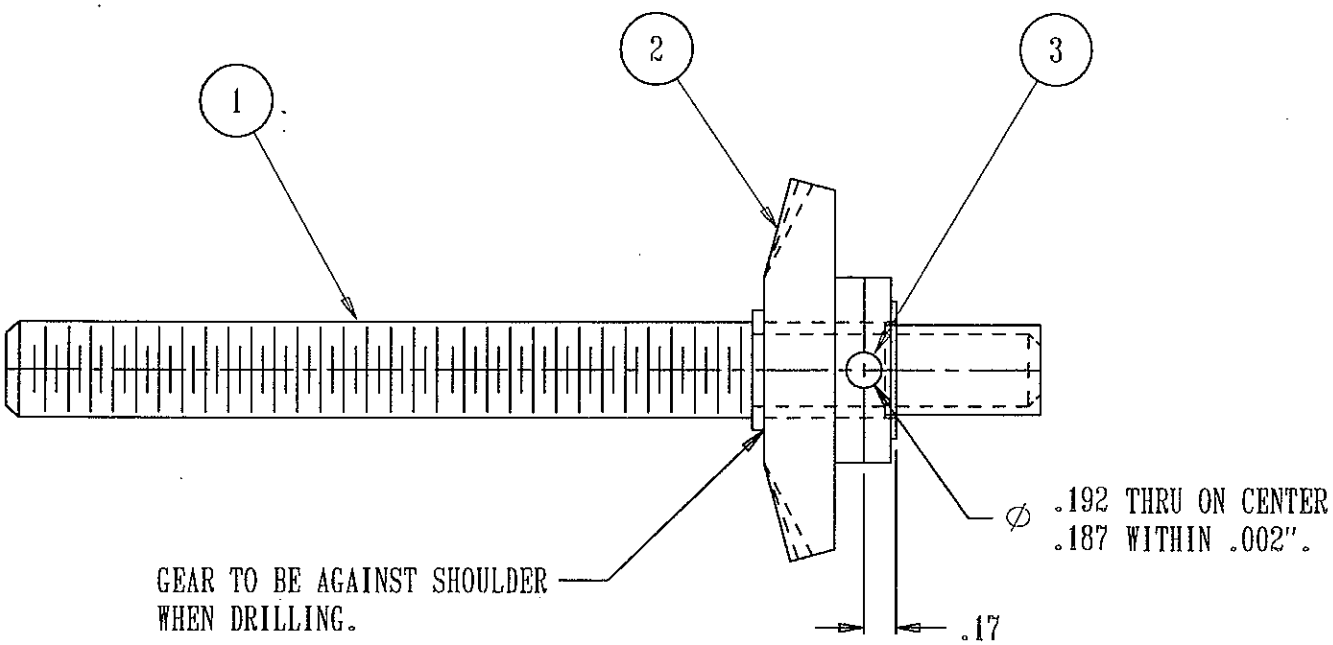
MIRROR ASSY.



QTY.	ITEM	PART NO.	DESCRIPTION
6	6	48 6072	HEXNUT
3	5	48 6033	WASHER
3	4	48 7846	SPRING
1	3	22 4114-0088	MIRROR
3	2	48 6854	WASHER, FLAT NYLON
1	1	22 4131-01	MIRROR PAD PLATE ASSY.

LIST OF MATERIALS

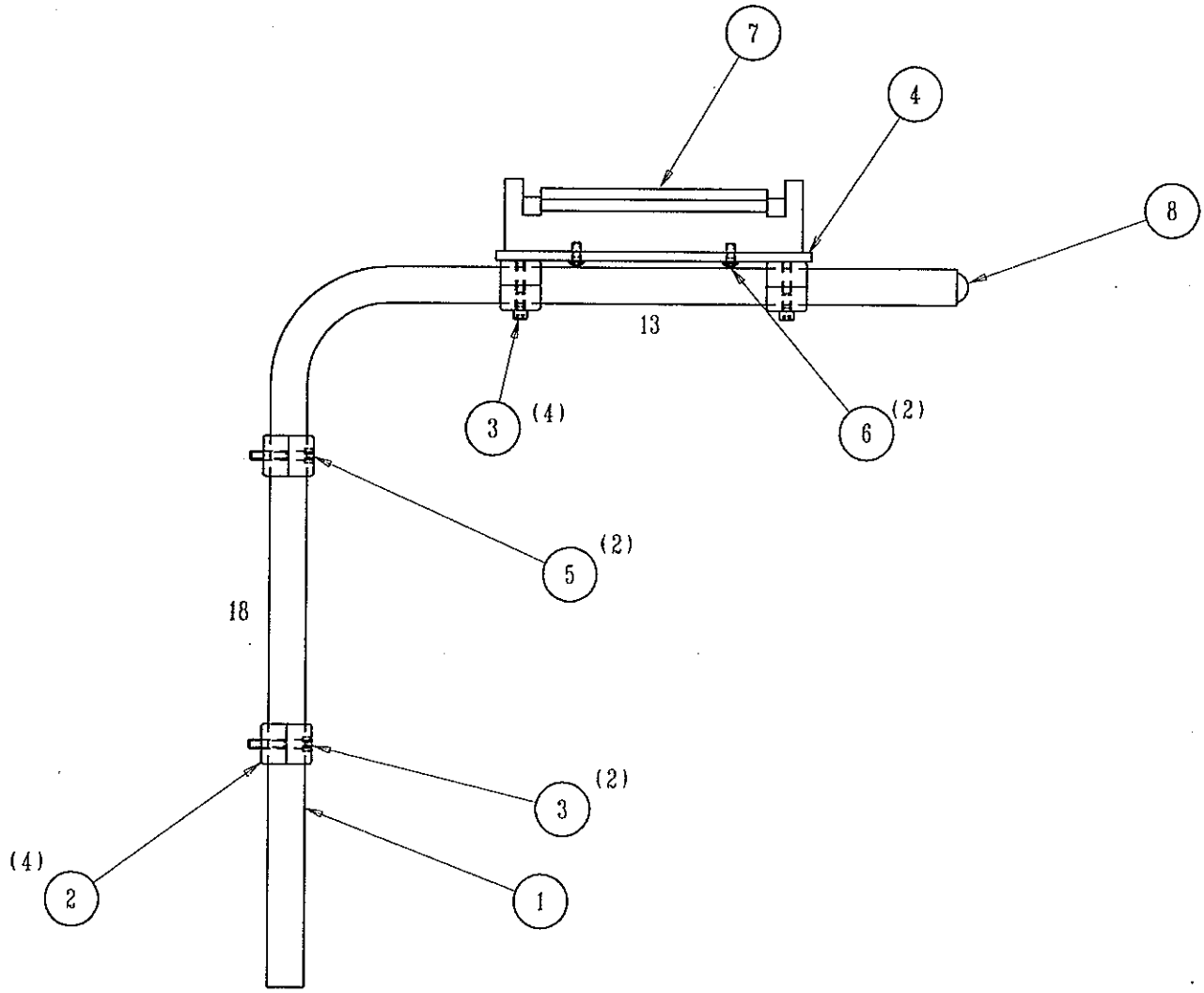
VERT. SCREW & NYLON GEAR ASSY.



QTY.	ITEM	PART NO.	DESCRIPTION
1	3	48 5121	SPRING PIN 3/16 DIA. X 1 1/8 LG.
1	2	22 3712-56	GEAR, NYLON BEVEL
1	1	22 4129-06	VERTICAL SCREW & BUSHING ASSY.

LIST OF MATERIALS

READOUT ARM ASSY.



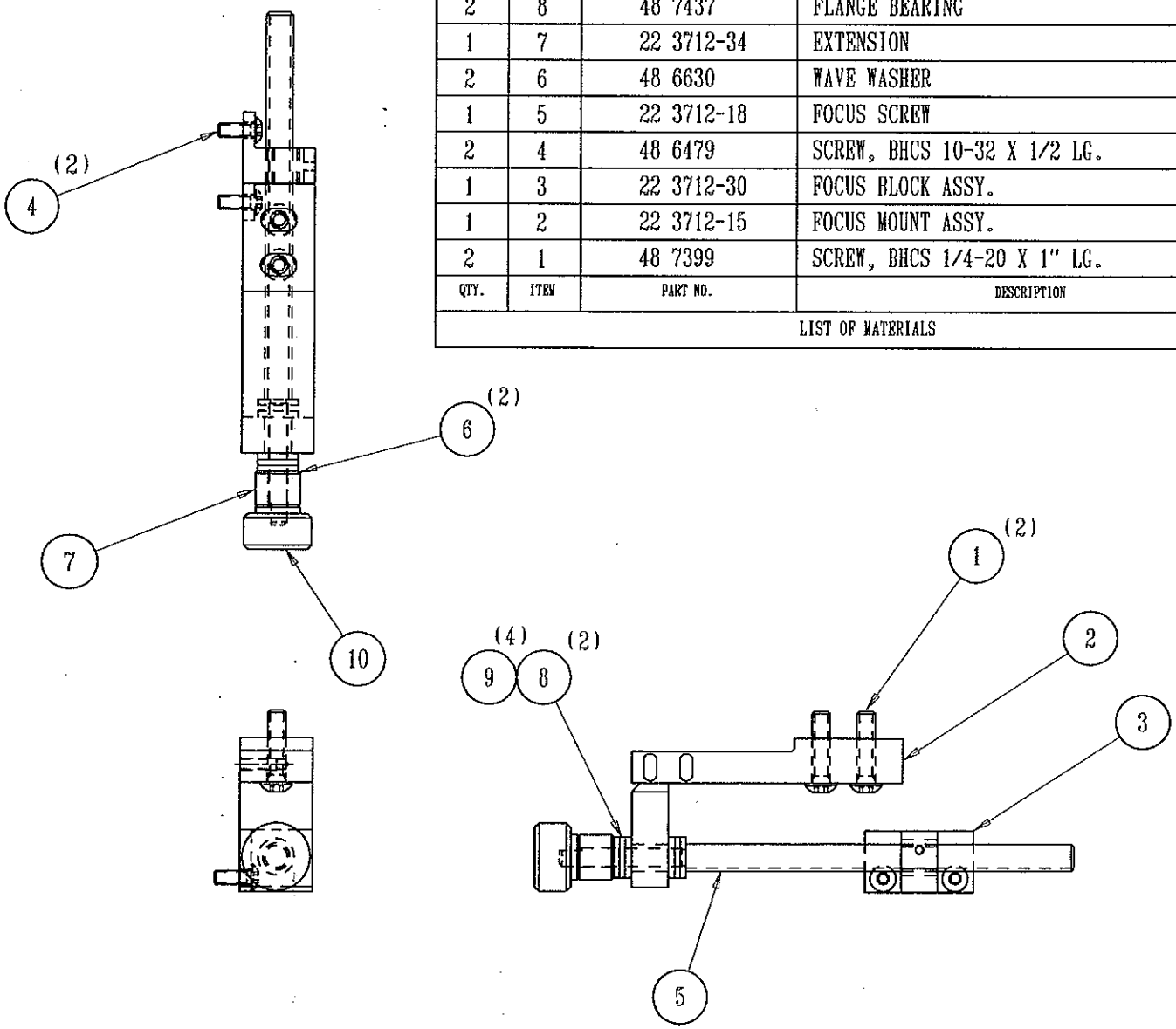
QTY.	ITEM	PART NO.	DESCRIPTION
1	8	48 7019-04	HOLE PLUG
1	7	48 8238	OEM MOUNT
2	6	48 6046	SCREW, BHCS 1/4-20 X 3/4 LG.
4	5	48 5391	SCREW, SHCS 1/4-20 X 1 3/4 LG.
1	4	22 4047-00	READOUT PLATE
6	3	48 5401	SCREW, SHCS 1/4-20 X 1 1/2 LG.
4	2	48 8121	STAUFF CLAMP
1	1	22 4042-01	DRO ARM, PAINTED

LIST OF MATERIALS

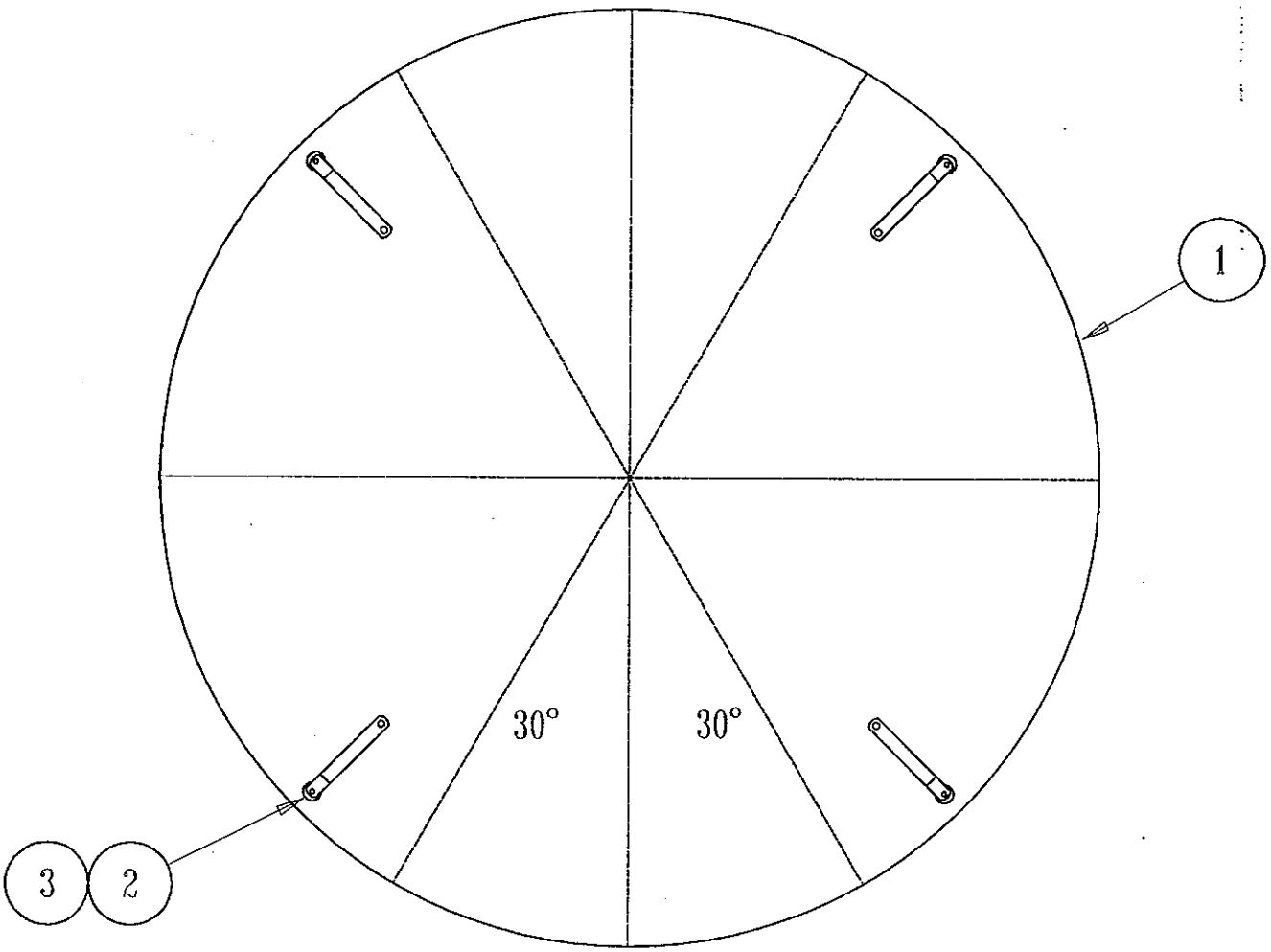
FOCUS SCREW ASSY.

QTY.	ITEM	PART NO.	DESCRIPTION
1	10	48 7790	KNOB, FOCUS
4	9	48 7646	THRUST BEARING
2	8	48 7437	FLANGE BEARING
1	7	22 3712-34	EXTENSION
2	6	48 6630	WAVE WASHER
1	5	22 3712-18	FOCUS SCREW
2	4	48 6479	SCREW, BHCS 10-32 X 1/2 LG.
1	3	22 3712-30	FOCUS BLOCK ASSY.
1	2	22 3712-15	FOCUS MOUNT ASSY.
2	1	48 7399	SCREW, BHCS 1/4-20 X 1" LG.

LIST OF MATERIALS

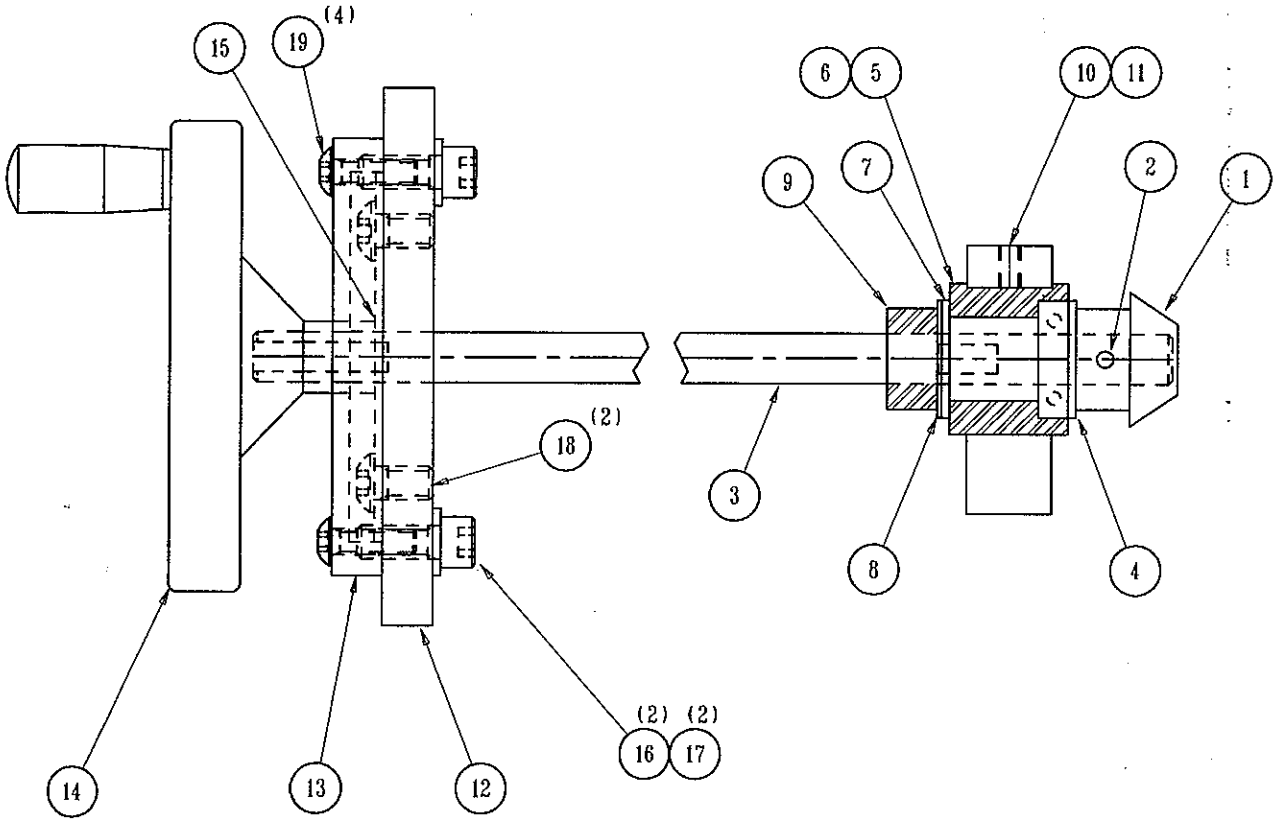


15" GLASS SCREEN



QTY.	ITEM	PART NO.	DESCRIPTION
4	3	48 8149	REPLACEMENT RUBBER BUMPER
4	2	22 3952-10	SCREEN CLIP ASSY.
1	1	74 0008-1525	15" GLASS SCREEN

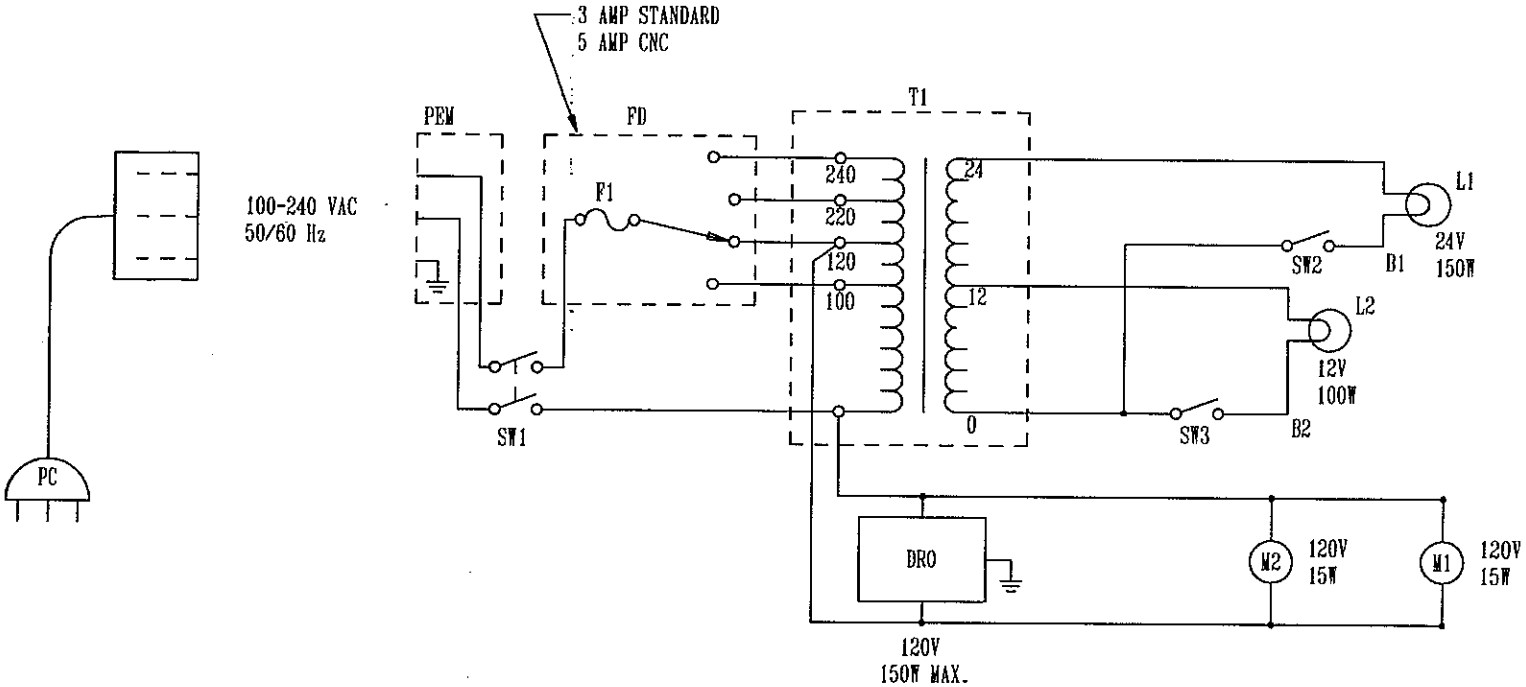
VERTICAL DRIVE ASSY.



QTY.	ITEM	PART NO.	DESCRIPTION
4	19	48 5622	SCREW, BHCS 10-32 X 5/8 LG
2	18	48 5430	SCREW, BHCS 1/4-20 X 3/8 LG.
2	17	48 6069	WASHER
2	16	48 5320	SCREW, SHCS 1/4-20 X 3/8 LG.
1	15	48 7690	BEARING FLANGE
1	14	22 3831	HAND WHEEL 2 SPOKE PLASTIC
1	13	22 3936-08	COVER
1	12	22 4034-03	BEARING MOUNT
1	11	48 5244	SET SCREW 8-32 X 3/16 LG.
1	10	22 3936-09	BEARING BRACKET
1	9	48 5125	SETSCREW COLLAR
1	8	48 7695	WASHER, TEFLON
1	7	48 5979	WASHER .39 I.D. X .88 O.D.
1	6	22 3713-02	ADJ. BUSHING
1	5	48 7691	BEARING
1	4	48 7696	WASHER .38 I.D. X .63 O.D.
1	3	22 4130-01	DRIVE SHAFT (16" COMP)
1	2	48 5124	1/8 SPRING PIN
1	1	22 2079	BEVEL GEAR

LIST OF MATERIALS

3700 ELECTRICAL WIRING SCHEMATIC



WA	22 4135-00	WIRE ASSY.
T1	48 8182	TRANSFORMER
SW1	48 7443	MAIN POWER SWITCH
SW2	48 7700	PROFILE ILLUM. SWITCH
SW3	48 7700	SURFACE ILLUM. SWITCH
L1	48 7291	PROFILE BULB
L2	48 7747	SURFACE BULB
M2	22 3426	COOLING FAN
M1	22 3426	COOLING FAN
PEM	48 7444	POWER ENTRY MODULE
FD	48 7445	FUSE DRAWER
F1	48 6215	FUSE 3 AMP @ 120 VOLTS
PC	48 7337	POWER CORD
ITEM	PART NO.	DESCRIPTION

LIST OF MATERIALS

WARRANTY

Within two years from the date of purchase, any repairs necessary due to defects in material or workmanship will be made without charge by S-T Industries, Inc. Normal wear and tear is not covered by this warranty. This warranty applies to the original purchaser only and is not transferable. No other warranty, either expressed or implied, shall be applicable to this equipment. S-T Industries, Inc. liability does not extend beyond the repair or replacement of this equipment.

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