UNDERWATER
PAN AND TILT
MODEL PT-10

OPERATING AND MAINTENANCE MANUAL

SERIAL NUMBER: _____

SALES ORDER: _____

ROS INCORPORATED

5618 Copley Drive
San Diego, CA 92111-7902
TEL (858) 565-8500
FAX (858) 565-8808
www.rosys.com

21-00019 REV B

WARRANTY

Remote Ocean Systems, Inc. (hereinafter called "**ROS**") warrants its products as stated below subject to the conditions specified.

ROS warrants its products, when operated under normal conditions, to be free from defects in material or workmanship for a period of one year from the date of purchase provided that inspection by **ROS** discloses that such defects developed under normal and proper use. **ROS** products repaired or replaced pursuant to this warranty shall be warranted for the unexpired portion of the warranty applying to the original product. The liability of **ROS** under this warranty shall exist subject to the following conditions:

(a) **ROS** is properly notified of such defects by Purchaser, and the defective product is returned to **ROS**, transportation charges paid by Purchaser.

(b) **ROS** shall be released from all obligations under its warranty in the event repairs or modifications are made by persons not authorized by **ROS**.

(c) Representations and warranties made by any person, including distributors and representatives of **ROS,** which are inconsistent or in conflict with the terms of this warranty, shall not be binding upon **ROS** unless reduced to writing and approved by an officer of **ROS**. **ROS** shall in no event be liable for other direct, special, incidental, consequential, indirect or penal charges.

(d) This warranty shall be governed by the laws of the State of California.

In the event the defect is determined to be within the terms of this warranty, then **ROS** agrees to repair and/or replace (at **ROS**'s discretion) the product or defective portion at no charge to the Purchaser. This warranty does not apply to expendable items nor to normal wear and tear and is conditional upon performance of normal preventative maintenance procedures.

Our commitment to quality and customer service directs us to constantly strive to improve our products. The materials and specifications presented in our manuals and data sheets are correct and accurate to the best of our knowledge, and are presented in good faith. However, the information is not guaranteed and is subject to change without notice.

LIMITATION OF REMEDIES

Purchaser assumes all risk and liability for results obtained in any installation, operation, or use of the product. Purchaser's sole remedy for any breach of warranty by vendor shall be limited to the "express remedies" set forth above. Otherwise, in no event shall vendor, its agents, or employees be liable to the original purchaser or any third party for any consequential or incidental damages or expenses of any nature arising directly out of or in connection with the use of vendor products. Even if vendor has been advised of the possibility of such damages or expenses. In any event, unless otherwise contrary to state law, vendor liability under this limited warranty shall not exceed the purchase price of the product.

CUSTOMER ASSISTANCE

ROS, Inc. uses a worldwide network of stocking distributors and representatives who are familiar with our products and are able to provide assistance during installation and/or operation of these products.

If you have any questions or problems with this product that are not covered by this manual or instruction, please contact our agent in your area, or contact us directly by phone, fax or e-mail.

TEL: (001) 858-565-8500

FAX: (001) 858-565-8808

e-mail: support@rosys.com

CHANGE RECORD

General Update to New Format	15APR97
Updated to a Standard PT-10 Manual	26MAR01
Added Quad Seal & Sealscrew Replacement to the “Seal Replacement” Section	28JUN05
Add configuration -02 (MHDL-12-FCR CONN)	02SEPT08

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INTRODUCTION

This publication describes the ROS model PT-10 Pan and Tilt which is available in two standard models; an air-filled version for nuclear and other shallow water applications, and an oil-filled pressure compensated unit for deep-water applications. For any problems or questions not covered in this manual, please contact the factory or one of our authorized representatives.

ROS, Inc. reserves the right to change or modify designs or specifications as part of its continuing product improvement program.

GENERAL DESCRIPTION

The model PT-10 Pan and Tilt is designed to remotely orient underwater or in-air TV and photographic cameras, lights, acoustic equipment, and other instrumentation.

The housing, end plates, and all machined internal components of the PT-10 are made of stainless steel, titanium or 6061-T6 aluminum which, is hard anodized for corrosion protection. Other external hardware such as screws and retaining rings are made of stainless steel.

The drive train for each axis of the pan and tilt uses a reversible synchronous motor coupled to low backlash harmonic gearing. The output gear of the harmonic reducer is bolted directly to the output shaft. Mounting plates for the motor and gear assemblies are held in position with internal retaining rings and anti-rotation keys. The output shafts are each supported by bronze bearings in the end caps. The basic design of the drive train is very compact, and it offers high reliability and minimum backlash.

If the PT-10 is oil-filled, then it is pressure compensated by use of a diaphragm. This provides a slight positive internal pressure to minimize shaft seal drag and potential leakage problems due to hydrostatic pressure. The oil also provides continuous lubrication and cooling to the internal components.

The PT-10 is designed such that either output shaft can be stalled without causing damage to either the gears or the motor. This allows the use of simple external stops to limit the angular range of motion if necessary.

Electrical connection is made through a miniature wet-mateable underwater connector. This connector has a right-angle configuration to minimize the swept-out volume requirements of the pan and tilt.

PT-10 SPECIFICATIONS

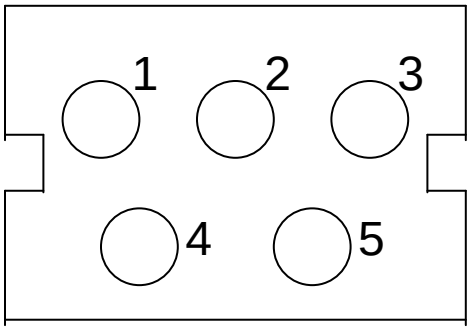
POWER:	120 VAC, 0.135 amp
OPERATING DEPTH:	
AIR-FILLED	100 ft. (30.48 m)
OIL-FILLED	9842.5 ft. (3000 m)
LENGTH:	7.6 inches (193 mm)
WIDTH:	5.8 inches (147mm)
DEPTH (w/connector):	4.0 inches (101mm)
WEIGHT IN AIR:	
AIR-FILLED:	
AL	6.5 lbs. (2.9 kg)
SS	10.8 lbs. (4.9 kg)
OIL-FILLED:	
AL	7.0 lbs. (3.2 kg)
SS	11.3 lbs. (5.1kg)
WEIGHT IN WATER:	
AIR-FILLED:	
AL	4.2 lbs. (1.9 kg)
SS	8.5 lbs. (3.9 kg)
OIL-FILLED:	
AL	4.7 lbs. (2.2 kg)
SS	9.0 lbs. (4.1 kg)
ROTATION SPEED:	
60Hz:	4.9 degrees/sec (0.82RPM)
50Hz:	4.1 degrees/sec (0.68RPM)
TORQUE:	10 pounds foot (14 Nm) minimum
SCAN RANGE (both axes):	360 degrees
GEAR BACKLASH:	36 arc minutes
OUTPUT SHAFT SIZE:	1.00 inches (25.4 mm) diameter
HOUSING MATERIAL:	6061-T6 AL 304/316 SS
HOUSING FINISH:	Hard Black Anodize Electropolish
HOUSING MOUNTING:	Two OR four ¼-20 holes in pan shaft
EQUIPMENT MOUNTING:	Two ¼-20 holes in tilt shaft
CONNECTOR:	LPMBH-5-MP / MHDL-12-FCR
MATING CONNECTOR:	LPMIL-5-FS / MHDL-CCP
COMPENSATOR O/F:	Bellofram
COMPENSATING FLUID O/F:	Spindle Oil
OPTIONAL CONNECTORS:	FAWL-5S-MP FAWL-5P-FS

STANDARD-CONNECTOR-WIRING

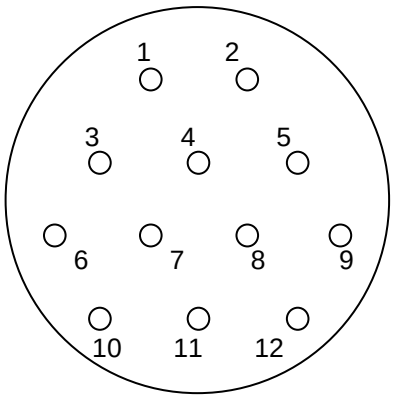
Connector Type: Five contact LPMBH-5-MP underwater mateable.

PIN NUMBER	CONNECTOR	FUNCTION	SHAFT ROTATION
1	120 VAC	COMMON	
2	120 VAC	TILT UP	TILT CCW
3	120 VAC	TILT DOWN	TILT CW
4	120 VAC	PAN RIGHT	PAN CW
5	120 VAC	PAN LEFT	PAN CCW

NOTE: Function directions are for a PT-10 mounted with the pan axis down. If inverted, the directions will be reversed.



Bulk head Connector
Configuration -01: LPMBH-5-MP (Face View)



Face mount Connector
Configuration -02: MHDL-12-FCR (Face view)

INSTALLATION AND OPERATION

When you receive the model PT-10 Pan and Tilt unit, unpack it carefully and inspect for any shipping damage or if oil-filled, oil leakage. Please contact the factory immediately if any such damage is noted.

OPERATIONAL CHECK

After unpacking the PT-10, an operational check should be made prior to installation of the unit. The following procedure is recommended:

1. Place the pan and tilt unit face down on a table with the connector up.

2. Make sure controller power is turned off.

3. Apply a small amount of silicone spray lubricant to the mating connector and carefully attach it to the bulkhead connector.

4. Attach the other end of the cable assembly to the pan and tilt controller or other control circuitry and operate both axes of the unit in both directions while observing the output shafts.

5. If any problems are noted, please contact the factory immediately.

INSTALLATION

The PT-10 can be operated in any attitude. The pan axis should be vertical, however, to maintain true azimuth and elevation motions without cross coupling. The unit is installed by mounting the pan axis to a permanent structure. Two 1/4-20 tapped holes are provided in the end of the output shaft for this purpose. If more convenient for your application, mounting plates are available from ROS. This plate attaches to the output shaft and has clearance mounting holes for bolting the plate to the fixed surface. The standard plate is four inches in diameter and has four mounting holes for 1/4 inch diameter bolts located on a 3.50 inch diameter bolt circle.

When the pan axis is rotated, all portions of the unit and the attached equipment rotate about the pan output shaft. The installation should provide adequate clearance for the pan and tilt and equipment.

NOTE: That if the pan and tilt is suspended from the pan axis rather than mounting with the pan shaft down, the pan and tilt directions indicated in the connector diagram will be reversed.

EQUIPMENT MOUNTING

Equipment to be oriented is mounted to the tilt axis of the pan and tilt. Two 1/4-20 tapped holes in the output shaft are provided for this purpose. A standard mounting plate as described above is available from ROS, Inc., and special mounting clamps and saddle brackets can be provided if necessary.

The PT-10 was designed to handle reasonable payloads to commensurate with the 10 foot-pound torque rating. Equipment size, weight, distance from the centers of both axes, undersea current drag, and forces due to equipment cables are all factors, which should be considered when mounting the equipment. Some general guidelines are as follows:

1. Mount the equipment as close as possible to the housing. This minimizes bearing drag forces on the pan axis.

2. Mount the equipment so that the center of gravity is close to the center of the tilt axis to minimize torque requirements. In some cases it is advantageous to add counterweights to achieve a more balanced configuration.

3. When possible, minimize cross sectional area of the equipment, which will be exposed to hydrodynamic drag forces.

4. Route equipment and pan and tilt cables so they move freely throughout the desired range of motions for the pan and tilt unit.

INTERCONNECTION

Interconnection is made through the underwater connector. To mate the connector, **TURN POWER OFF,** lubricate the connector lightly with silicone spray, push together, and move the retaining strap on the mating connector into position.

The opposite end of the cable attaches to a controller such as the ROS model PTC-2,or equivalent controller which provides the required power to the connector pins. Cable length and conductor size should be chosen such that a voltage of at least 100 VAC will be maintained at the pan and tilt while in operation. With 18 gauge conductors, a cable length of 5,000 feet can be used. If you have any questions regarding cable length of configuration, please contact the factory.

MAINTENANCE

The PT-10 Pan and Tilt was designed to provide a long lifetime of service with minimal maintenance.

If equipped with oil, the recommended routine maintenance is limited to checking the compensating fluid volume. If it is required, we recommend that the PT-10 be returned to the factory for such service. If this is not possible, field maintenance and repair should be limited to the procedures described in this manual. For unusual situations or if additional field maintenance is required, please contact the factory for assistance. The maintenance procedures covered in this manual are End Cap Removal, and Replacement, Seal Replacement, and Motor Removal and Replacement and if equipped with oil, Fluid Volume Checking.

FLUID VOLUME CHECK (If equipped with oil)

The compensator fluid volume should be checked periodically to assure that no fluid is leaking out of the unit due to worn seals, etc. This is done by a simple visual inspection of the compensator end of the tilt housing. The compensator diaphragm is enclosed by a protective cover with holes in the end for water flow. The unit is assembled with approximately 10 fl oz of spindle oil. When the fluid level is normal, the diaphragm will be expanded outward. Its position can be checked by visual observation through the holes or by using a blunt object inserted through the opening in the end of the cover. If fluid has leaked out, the diaphragm will become flat or recessed into the PT-10 housing, and the unit should be recharged with fluid.

WORK AREA PREPARATION

Any work done on the internal parts of the PT-10 requires the unit to be opened. A clean work area should be prepared to avoid getting dirt or other particles on the seals or sealing surfaces, or inside the motor or precision harmonic gearing.

If the PT-10 is oil-filled, there is a high probability of spillage when the unit is opened. Additional fluid should be available for refilling, and towels should be available for cleaning.

CAUTION: The PT-10 operates on 120 VAC. Extreme care should be taken to assure that power is turned off and the cable is disconnected before any maintenance is done.

END CAP REMOVAL

One or both end caps must be removed for any internal maintenance procedures. Both end caps are identical and removal procedures are the same.

CAUTION: If the unit is oil-filled, it is internally pressurized by the compensator.

1. Remove the two seal screws in the end cap. If the unit is oil-filled, allow the oil to drain out before continuing.

2. Remove the stainless steel ring, which retains the end cap.

3. Remove seal screws. Using a special end cap pulling tool, thread the two 10-32 bolts into the seal screw holes.

4. Restrain the housing and pull the end cap out of the housing. **NOTE**: The end cap, bearing assembly, output shaft, and output harmonic gear form an assembly, and no attempt should be made at further disassembly of these components without contacting the factory.

For replacement of the endcap, refer to the **END CAP REPLACEMENT** section of this manual.

SEAL REPLACEMENT

Whenever the end caps are removed, the O-Rings, quad seals, and Seelscrews should be carefully inspected for damage, and to assure cleanliness. If there is any seal damage, or if the unit is oil-filled and there is leakage, the O-rings and seals should be replaced.

1. Remove the end cap as described in the **END CAP REMOVAL** section.

2. Remove the old O-ring and quad seal.

3. Clean O-ring and quad seal surfaces.

4. Apply a small amount of silicone grease or other O-ring lubricant to the new seals and install them in the grooves of the end cap. Avoid excessive stretching of the O-ring. Refer to the **END CAP REPLACEMENT** section of this manual for additional procedures.

If the unit is oil-filled and if the fluid is leaking near the compensator cover, the diaphragm should be inspected and replaced if damaged. Remove the retaining ring, which attaches to the compensator cover. Remove the cover. Remove the diaphragm by pulling out the compensator plug.

Carefully inspect the diaphragm for any tears or nicks, particularly in the vicinity of the sealing edge. Replace if damaged. Clean the sealing surfaces, apply a small amount of O-ring lubricant to these surfaces and the sealing surfaces of the diaphragm. Replace the diaphragm, compensator plug, and the cover. Refill the unit with fluid.

NOTE: If water leakage has occurred and you suspect it may be caused by a worn output shaft seal, please contact ROS, Inc. for assistance. Replacement of these seals requires

special equipment and procedures.

MOTOR REMOVAL AND REPLACEMENT

The motors used in the PT-10 are brushless 120 VAC synchronous motors, and are noted for very long lifetimes without maintenance. Before undertaking motor replacement, make sure that proper operating voltage is being provided by the controller and interconnecting cable.

1. Remove the end cap as described in END CAP REMOVAL section and if oil-filled, drain the remaining compensating fluid.

2. Remove the Adapter plate with the output connector still attached. De-solder the wires, labeling them for later re-assembly if needed.

3. Grasp the output shaft and remove the shaft together with the attached bearing plate.

4. The motor plate, which attaches to the motor and the fixed harmonic gear are now visible. Remove the retaining ring in the housing bore and the retaining ring, which secures the motor plate assembly. Be careful not to scratch the inside of the housing with the ends of the rings, particularly in the vicinity of the O-ring sealing surfaces. Keep these rings separate from the outer rings, which retain the end caps. The outer rings are made of stainless steel for corrosion protection. If one of the retaining rings is “wavy”, note that it belongs closest to the motor.

The motor assembly can be removed in most cases by inverting the housing and tapping it lightly with a non-metallic hammer or other object. If this technique is used, be careful to protect the gear and motor assembly as it slides out of the housing.

NOTE: If the first technique doesn’t work, the motor plate has three #8-32 tapped holes on a 2.20 inch diameter bolt circle which are used for removal of the plate and motor. A puller assembly can be fashioned from three long (five inch) #8-32 screws made from threaded rod, three #8-32 nuts, and a 1/4 inch thick plate with clearance holes for the screws on a 2.20 inch diameter bolt circle. This plate should be 2.7 inches or larger in diameter.

5. Pass the screws through the holes in the plate and thread into the motor plate. Tighten the nuts on the threaded shafts each in sequence to draw the motor plate assembly out of the housing without binding.

6. When the motor assembly is removed, be careful that the locking pin is not lost. This normally remains attached to the inside wall of the housing.

If defective, the entire motor assembly including the motor plate and the attached gears should be returned to ROS for repair or replacement. If return is not possible, the motor plate, motor, and harmonic gear component must be taken dis-assembled to replace the

motor.

7. **NOTE:** The position of the wave generator with respect to the motor shaft. Loosen the setscrews, which hold the wave generator to the motor shaft and remove this section of the gear mechanism.

8. Remove the three flat head screws, which attach the motor plate to the motor assembly.

9. Replace the motor assembly including the attached resistor and capacitor. Apply shrink tubing over the soldered connections for insulation protection.

10. Mount the new motor to the motor plate using a removable thread retainer and re-attach the wave generator to the motor shaft.

11. Make sure the locking pin is in place and slide the motor assembly into position so that the key fits properly into the slot in the motor plate as nearly as possible to the original position.

12. Replace the internal retaining rings.

Replace the end cap as described in the **END CAP REPLACEMENT** section of this manual.

END CAP REPLACEMENT

IF AIR-FILLED:

1. Clean exposed drive surfaces of the harmonic drive components and apply a liberal coating of high pressure, lithium bearing grease to all components.

2. Inspect and/or replace the end cap O-ring. Lubricate the O-ring with silicone grease as necessary.

3. Using silicone grease or O-ring lubricant, completely fill the top retaining ring groove. If this is not done, the sealing O-ring may be damaged when the end cap is installed.

4. Position the end cap assembly into the housing without pressing it in. Push the end cap down until the O-ring is at the snap ring groove. Slowly continue to press the end cap into the housing. **DO NOT** apply forces to the end of the shaft. Install the snap ring and new Seelscrews.

IF OIL-FILLED:

With the shaft end up, fill the unit with compensating fluid to approximately one half inch from the top. Position the end cap assembly into the housing without pressing it in. Since

fluid may be ejected through the seal screw holes, place a towel over the end cap to reduce the losses. Push the end cap down until the O-ring is at the snap ring grove. Replace the seal screws. Continue to press the end cap/shaft assembly in the housing bore and slowly push it into the housing. **DO NOT** apply large forces to the end of the shaft. If the harmonic drive does not want to remesh easily, it is helpful to slightly rotate the output shaft allowing the gear teeth to engage while applying moderate pressure to the end cap. Install the snap ring, which retains the end cap, and replace the seal screws located in the end plate.

APPENDIX

PT-10 DRAWINGS

21-00002	Installation Drawing, PT-10
21-00000	Assembly, PT-10-Air-Al
21-00001	Assembly, PT-10-Air-SS
21-01000	Assembly, PT-10-Oil-Al
21-01001	Assembly, PT-10-Oil-SS
21-00003	Wiring Diagram, PT-10

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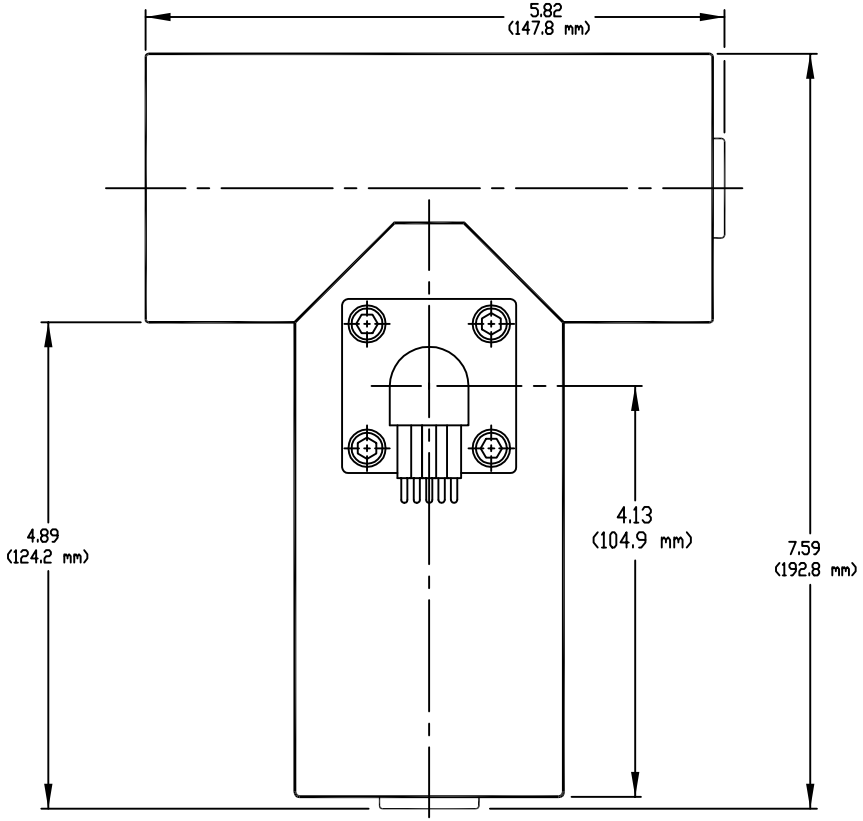
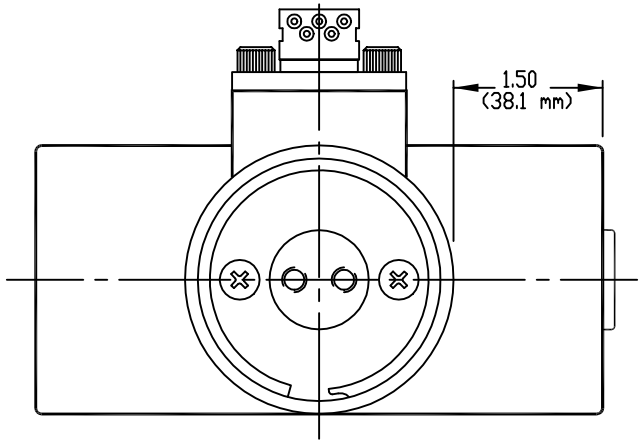
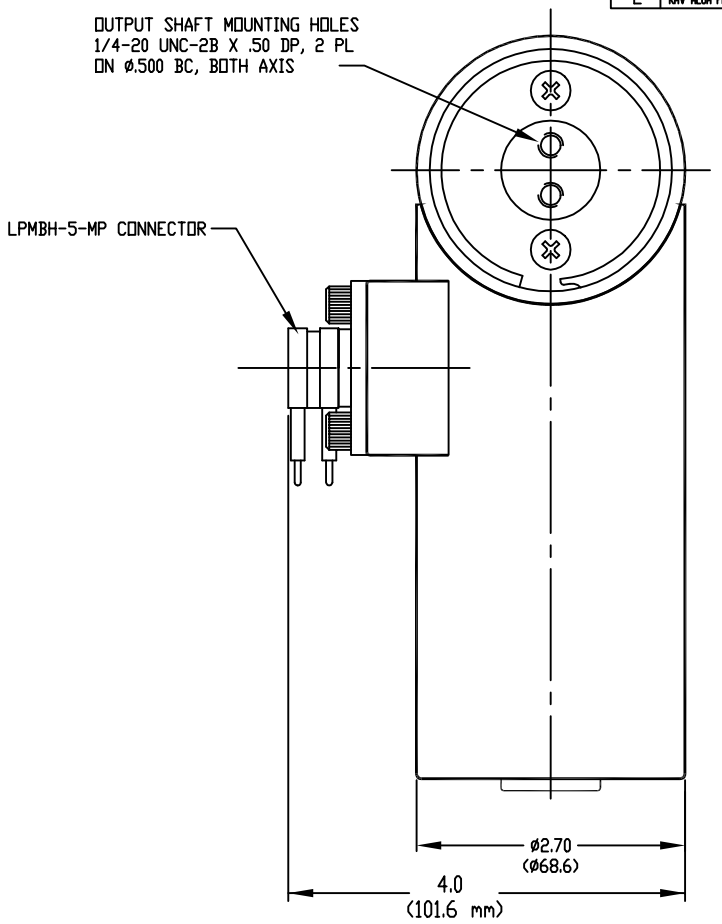
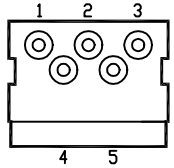
REV	DESCRIPTION	DATE
A	REDRAWN FROM K.S. ORIGINAL	02/21/95
B	ADDED DIMENSIONS AND INFORMATION	04/28/95
C	UPGRADE TO RDS 1997 STATUS	10/28/97
D	ADD AIR/OIL FILLED TO TITLE BLOCK	02/15/99
E	RMV ALUM FR T/B, ADD SST TO NT 1 & UDTD F/D. gta	02/15/99







CONNECTOR PIN OUT



PIN	FUNCTION
1.	COMMON
2.	TILT CCW (UP)
3.	TILT CW (DOWN)
4.	PAN CW (RIGHT)
5.	PAN CCW (LEFT)

3. CONNECTOR: IMPULSE LPMBH-5-MP
2. EXPOSED HARDWARE (FASTENERS...ETC.) STAINLESS STEEL
1. HOUSING MATERIAL: HARD BLACK ANODIZED ALUMINUM OR ELECTROPOLISHED 316 SST.

NOTES (UNLESS OTHERWISE SPECIFIED)

WEIGHTS - POUNDS (KILOGRAMS)

PT-10-AIR-AL, AIR: 6.5 (2.9) WATER: 4.2 (1.9)
PT-10-AIR-SS, AIR: 10.8 (4.9) WATER: 8.5 (3.9)
PT-10-OIL-AL, AIR: 7.0 (3.2) WATER: 4.7 (2.2)
PT-10-OIL-SS, AIR: 11.3 (5.1) WATER: 9.0 (4.1)

-03	-02	-01	ITEM NO.	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION
QTY/ASSY						

NEXT ASSEMBLY: END ITEM

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES

TOLERANCES
.X = +/- .030
.XX = +/- .010
.XXX = +/- .005
ANGULAR +/- 30'

SURFACE TEXTURE:

PREPARED	RoToCo	02/17/95
CHECKED		
QA		

RELEASED BY

RemoteOceanSystems

INSTALLATION & OUTLINE
AIR OR OIL FILLED
PT-10 PAN & TILT

SIZE	CAGE CODE	DWG NO.	REV LTR
C	2T637	21-00002	E

SCALE FULL | WEIGHT | SHEET 1 OF 1

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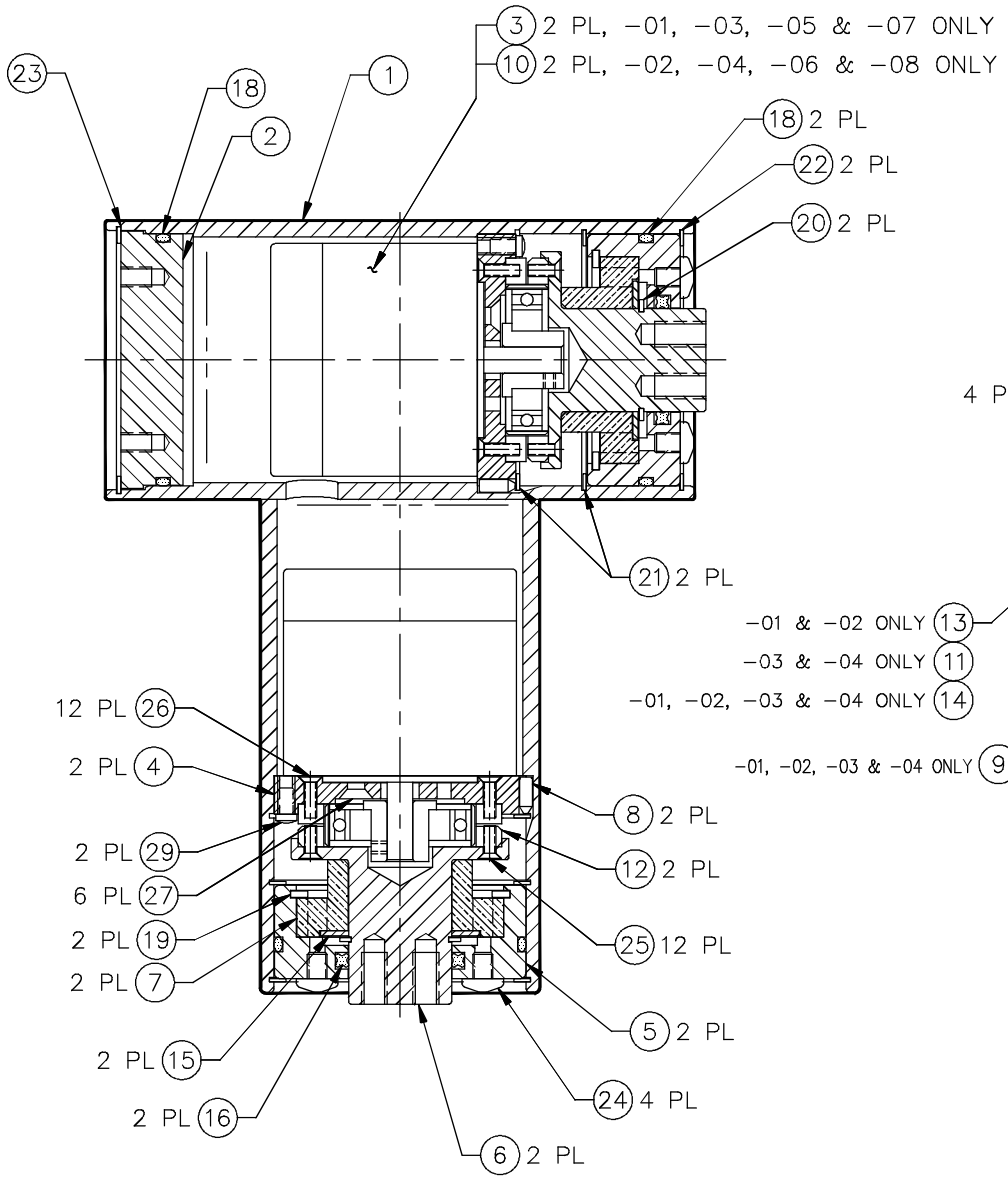
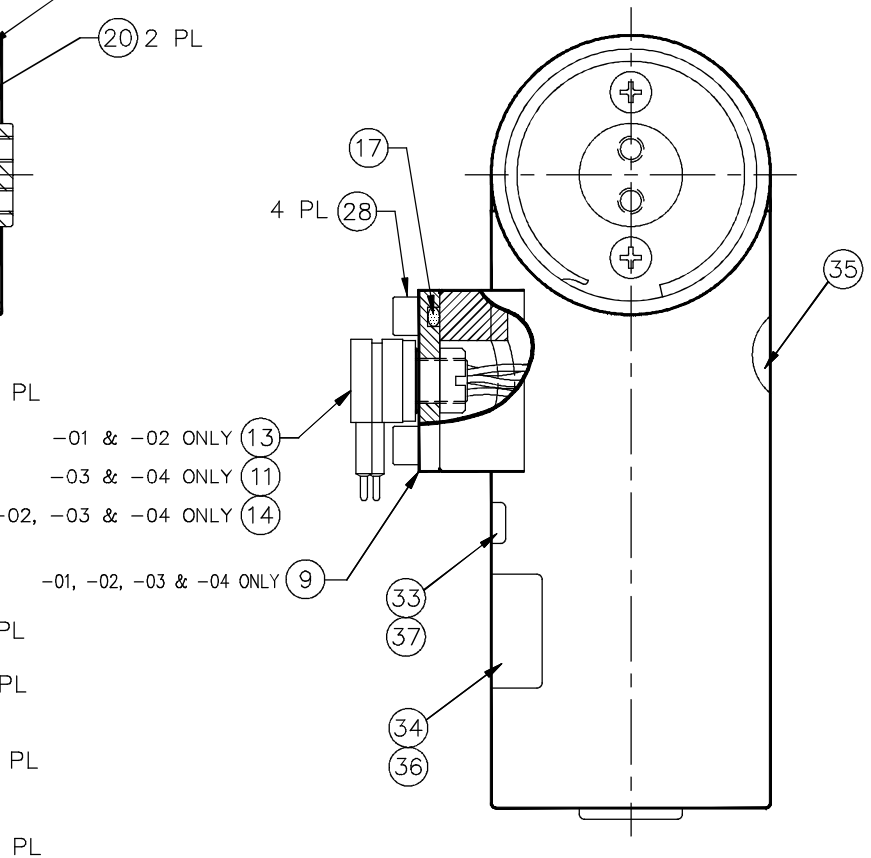
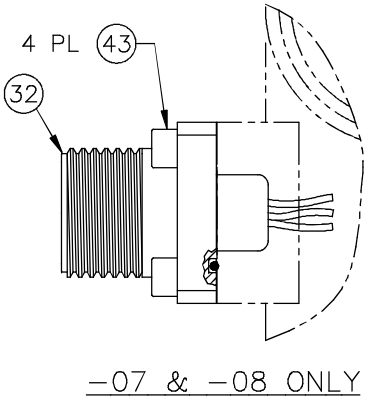
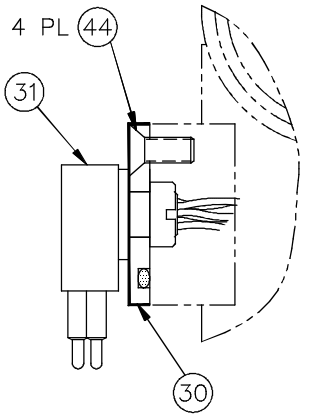
REV	DESCRIPTION		DATE
A	UPDATED		4-15-97
B	ADDED -03 & SEPARATE P/L		GTA 3-13-00
C	SEE ECO NO. 220	GTA	9-25-00
D	SEE ECO NO. 333	SM	2-08-01
E	SEE ECO NO. 433	SM	5-7-01
F	ADDED ITEM 29	gta	3-27-03
G	SEE ECO NO. 971	rjl	17DEC04
H	SEE ECO No 948.	gta	3MAY07
J	SEE EC-00113	SW	08APR09
K	SEE EC-01157	GAR	24JUL12







-07 & -08 ONLY



-05 & -06 ONLY

SEE SEPARATE PARTS LIST PL2100000

-03 QTY/ASSY	-02 QTY/ASSY	-01 QTY/ASSY	ITEM NO.	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION

NEXT ASSEMBLY: END ITEM

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES

TOLERANCES
.X = +/- .030
.XX = +/- .010
.XXX = +/- .005
ANGULAR +/- 30'

SURFACE TEXTURE: $\sqrt{}$

PREPARED	GTA	01/11/96
CHECKED	D. Myers	04/19/97
QA	O. Correa	04/17/97
RELEASED BY	P. Raetzman	

Remote Clear Systems

PAN & TILT ASSEMBLY
PT-10-AC-AIR-AL

SIZE	CAGE CODE	DWG NO.	REV LTR
C	2T637	21-00000	K

SCALE 1/1 | WEIGHT | SHEET 1 OF 1

2. ASSY TO CONFORM TO ROS PROCEDURES 98-10026 & 98-10027.

1. REF: WIRING DIAGRAM 21-00003.

NOTES (UNLESS OTHERWISE SPECIFIED)

PARTS LIST	RemoteOceanSystems	CAGE CODE 2T637	PL 2100000	REV K

QUANTITY REQD				TITLE PAN & TILT ASSY – PT-10-AC-AIR-AL			SHT 1 OF 4	DATE 3-13-00
-04	-03	-02	-01	ITEM NO.	PART NO.	DESCRIPTION	REMARKS	
			X		21-00000-01	PAN & TILT ASSY – 120VAC 60Hz, LPMBH-5MP CONN		
		X			21-00000-02	PAN & TILT ASSY – 120VAC 50Hz, LPMBH-5MP CONN		
	X				21-00000-03	PAN & TILT ASSY – 120VAC 60Hz, FAWL-5P-BC-R/A CONN		
X					21-00000-04	PAN & TILT ASSY – 120VAC 50Hz, FAWL-5P-BC-R/A CONN		
1	1	1	1	1	21-00010-01	HOUSING		
1	1	1	1	2	21-00080-01	REAR PLUG		
	2		2	3	21-03187-01	MOTOR ASSY – 120VAC, 60HZ		
2	2	2	2	4	21-00100-01	MOTOR PLATE		
2	2	2	2	5	21-00050-01	END CAP		
2	2	2	2	6	21-00110-01	OUTPUT SHAFT		
2	2	2	2	7	21-00120-01	BRONZE BEARING		
2	2	2	2	8	21-00180-01	LOCKING PIN		
1	1	1	1	9	21-00140-01	ADAPTER PLATE, CONN		
2		2		10	21-03199-01	MOTOR ASSY – 120VAC, 50HZ		
1	1			11	60-11030-4	CONNECTOR, 5 PIN	FAWL-5P-BC-R/A-1/2	
2	2	2	2	12	21-02020-4	HARMONIC GEAR SET 88:1		
		1	1	13	60-01080-4	CONNECTOR, 5 PIN	LPMBH-5-MP	
1	1	1	1	14	60-04090-4	NUT, CONN		
2	2	2	2	15	21-02040-4	THRUST WASHER		
2	2	2	2	16	60-24214-4	QUAD-RING SEAL		
1	1	1	1	17	60-20215-4	O-RING SEAL		
3	3	3	3	18	60-20140-4	O-RING SEAL		
2	2	2	2	19	21-02070-4	RETAINING RING		
2	2	2	2	20	21-02080-4	RETAINING RING		
4	4	4	4	21	21-02090-4	RETAINING RING		

PARTS LIST	RemoteOceanSystems	CAGE CODE 2T637	PL 2100000	REV K
QUANTITY REQD	TITLE PAN & TILT ASSY - PT-10-AC-AIR-AL		SHT 2 OF 4	DATE 3-13-00

-04	-03	-02	-01	ITEM NO.	PART NO.	DESCRIPTION	REMARKS
2	2	2	2	22	21-02100-4	RETAINING RING	
1	1	1	1	23	21-02110-4	RETAINING RING	
4	4	4	4	24	62-20012-4	SEAL SCR, #10-32 X .25 LG	
12	12	12	12	25	62-00241-4	FLT HD SCR, M3 X 8 LG	SST
12	12	12	12	26	62-00242-4	FLT HD SCR, M3 X 10 LG	SST
6	6	6	6	27	62-00157-4	FLT HD SCR, #8-32 X .375 LG	SST
4	4	4	4	28	62-20133-4	SOC HD CAP SCR, .250-20 X .50 LG	316 SST
2	2	2	2	29	21-00074-01	BUTTON HD SCR, MOD - AID	
				30	21-00142-01	ADAPTER PLATE, CONN	
				31	60-04102-4	CONNECTOR, 5 PIN	LPBH-5-MP-1/2
				32	60-04078-4	CONNECTOR, 6 PIN	5506-2006-FCR
1	1	1	1	33		LABEL, 120VAC	
1	1	1	1	34		LABEL, ID	
1	1	1	1	35		LABEL, LOGO	
1	1	1	1	36		PROTECTIVE COVER, CLEAR, ID LABEL	
1	1	1	1	37		PROTECTIVE COVER, CLEAR, VOLTAGE LABEL	
REF	REF	REF	REF	38	21-00003	WIRING DIAGRAM	
1	1	1	1	39	21-00019	MANUAL	
REF	REF	REF	REF	40	21-00002	INSTALLATION/OUTLINE DWG	
REF	REF	REF	REF	41	21-00029	TEST PROCEDURE	
1	1	1	1	42	21-01021-01	HARDWARE KIT, PT-10	
				43	62-20104-4	SOC HD CAP SCR, .250-20 X .625 LG	316 SST
				44	62-20144-4	FLT HD SCR, .250-20 X .50 LG	316 SST
				45			
				46			
				47			

PARTS LIST	RemoteOceanSystems	CAGE CODE 2T637	PL 2100000	REV K
QUANTITY REQD	TITLE PAN & TILT ASSY - PT-10-AC-AIR-AL		SHT 3 OF 4	DATE 3-13-00

-08	-07	-06	-05	ITEM NO.	PART NO.	DESCRIPTION	REMARKS
			X		21-00000-05	PAN & TILT ASSY - 120VAC 60Hz, LPBH-5MP CONN	
		X			21-00000-06	PAN & TILT ASSY - 120VAC 50Hz, LPBH-5MP CONN	
	X				21-00000-07	PAN & TILT ASSY - 120VAC 60Hz, 5506-2006 CONN	
X					21-00000-08	PAN & TILT ASSY - 120VAC 50Hz, 5506-2006 CONN	
1	1	1	1	1	21-00010-01	HOUSING	
1	1	1	1	2	21-00080-01	REAR PLUG	
	2		2	3	21-03187-01	MOTOR ASSY - 120VAC, 60HZ	
2	2	2	2	4	21-00100-01	MOTOR PLATE	
2	2	2	2	5	21-00050-01	END CAP	
2	2	2	2	6	21-00110-01	OUTPUT SHAFT	
2	2	2	2	7	21-00120-01	BRONZE BEARING	
2	2	2	2	8	21-00180-01	LOCKING PIN	
		1	1	9	21-00140-01	ADAPTER PLATE, CONN	
2		2		10	21-03199-01	MOTOR ASSY - 120VAC, 50HZ	
				11	60-11030-4	CONNECTOR, 5 PIN	FAWL-5P-BC-R/A-1/2
2	2	2	2	12	21-02020-4	HARMONIC GEAR SET 88:1	
				13	60-01080-4	CONNECTOR, 5 PIN	LPMBH-5-MP
		1	1	14	60-04090-4	NUT, CONN	
2	2	2	2	15	21-02040-4	THRUST WASHER	
2	2	2	2	16	60-24214-4	QUAD-RING SEAL	
1	1	1	1	17	60-20215-4	O-RING SEAL	
3	3	3	3	18	60-20140-4	O-RING SEAL	
2	2	2	2	19	21-02070-4	RETAINING RING	
2	2	2	2	20	21-02080-4	RETAINING RING	
4	4	4	4	21	21-02090-4	RETAINING RING	

PARTS LIST	Remote Ocean Systems	CAGE CODE 2T637	PL 2100000	REV K

QUANTITY REQD				TITLE PAN & TILT ASSY - PT-10-AC-AIR-AL			SHT 4 OF 4	DATE 3-13-00
-08	-07	-06	-05	ITEM NO.	PART NO.	DESCRIPTION	REMARKS	
2	2	2	2	22	21-02100-4	RETAINING RING		
1	1	1	1	23	21-02110-4	RETAINING RING		
4	4	4	4	24	62-20012-4	SEAL SCR, #10-32 X .25 LG		
12	12	12	12	25	62-00241-4	FLT HD SCR, M3 X 8 LG	SST	
12	12	12	12	26	62-00242-4	FLT HD SCR, M3 X 10 LG	SST	
6	6	6	6	27	62-00157-4	FLT HD SCR, #8-32 X .375 LG	SST	
4	4	4	4	28	62-20133-4	SOC HD CAP SCR, .250-20 X .50 LG	316 SST	
2	2	2	2	29	21-00074-01	BUTTON HD SCR, MOD - AID		
		1	1	30	21-00142-01	ADAPTER PLATE, CONN		
		1	1	31	60-04102-4	CONNECTOR, 5 PIN	LPBH-5-MP-1/2	
1	1			32	60-04078-4	CONNECTOR, 6 PIN	5506-2006-FCR	
1	1	1	1	33		LABEL, 120VAC		
1	1	1	1	34		LABEL, ID		
1	1	1	1	35		LABEL, LOGO		
1	1	1	1	36		PROTECTIVE COVER, CLEAR, ID LABEL		
1	1	1	1	37		PROTECTIVE COVER, CLEAR, VOLTAGE LABEL		
REF	REF	REF	REF	38	21-00003	WIRING DIAGRAM		
1	1	1	1	39	21-00019	MANUAL		
REF	REF	REF	REF	40	21-00002	INSTALLATION/OUTLINE DWG		
REF	REF	REF	REF	41	21-00029	TEST PROCEDURE		
1	1	1	1	42	21-01021-01	HARDWARE KIT, PT-10		
4	4			43	62-20104-4	SOC HD CAP SCR, .250-20 X .625 LG	316 SST	
		4	4	44	62-20144-4	FLT HD SCR, .250-20 X .50 LG	316 SST	
				45				
				46				
				47				

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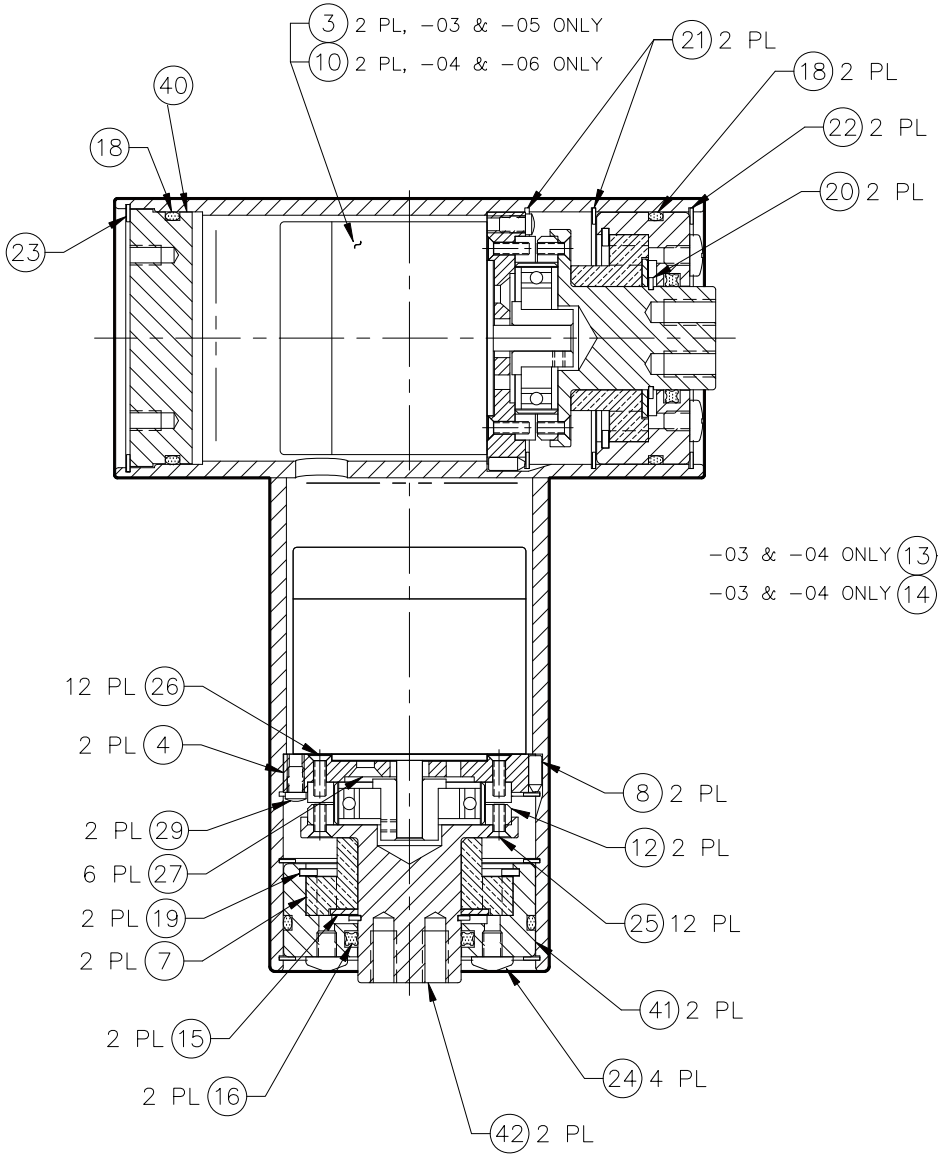
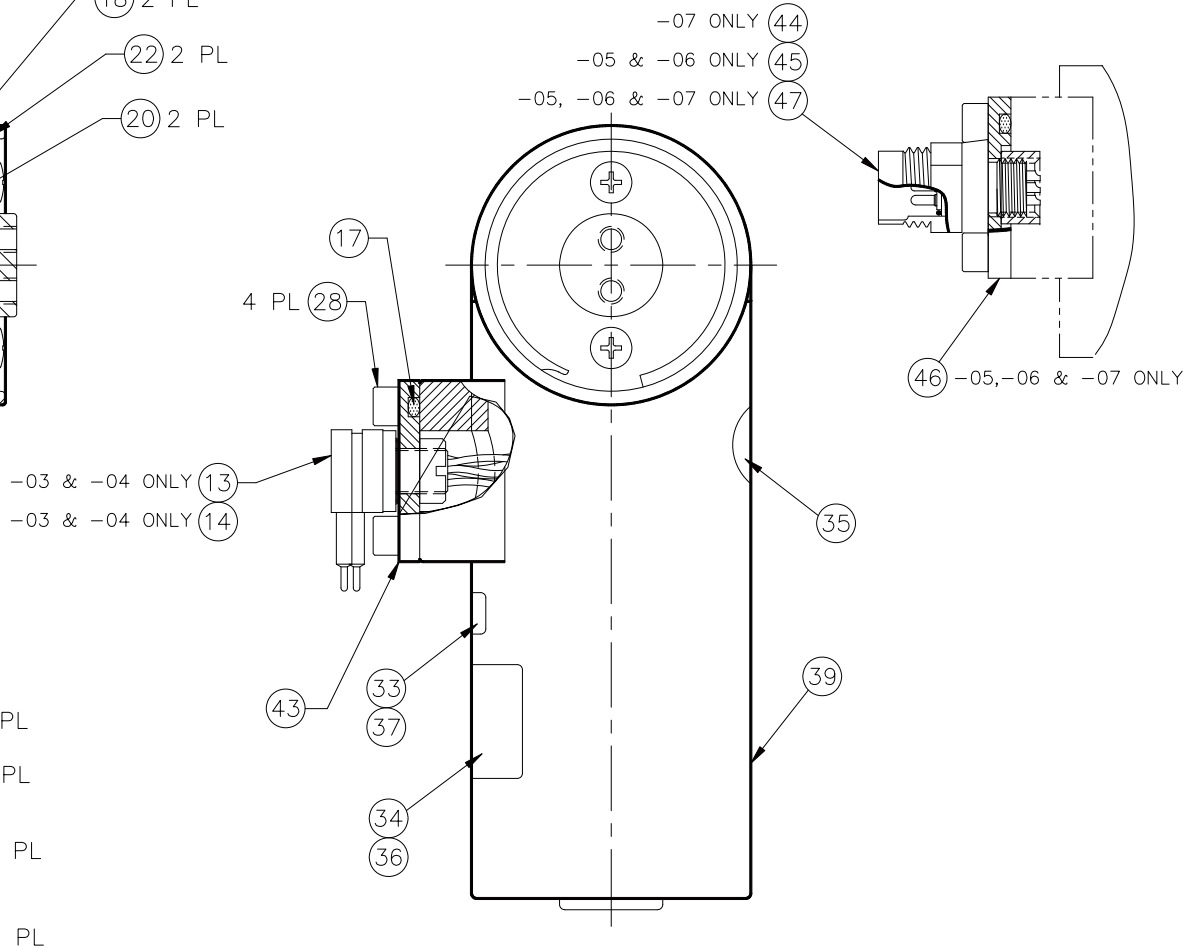
REV	DESCRIPTION		DATE
H	SEE ECN EC-0071	SW	14DEC10
A	SEE ECO NO. 044	GTA	5-30-00
B	SEE ECO NO. 434	SM	5-7-01
C	ADDED ITEM 29	gta	3-27-03
D	ADDED -05 & -06 CONFIGURATIONS, DELETED -01 & -02 CONFIGURATIONS	SW	6/16/05
E	SEE ECO No 944.	gta	30APR07
F	SEE ECN EC-00162	NBB	5 MAY 09
G	SEE ECN EC-00687	JAH	10OCT10





SEE SEPARATE PARTS LIST PL2100001

-03	-02	-01	ITEM NO.	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION
QTY/ASSY						

NEXT ASSEMBLY: END ITEM

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES

TOLERANCES
.X = +/- .030
.XX = +/- .010
.XXX = +/- .005
ANGULAR +/- 30'

SURFACE TEXTURE:

PREPARED	GTA	8-18-97
CHECKED	Debbie	8-26-97
QA	O. Correa	8-20-97
RELEASED BY	P. Raetzman	

Remote Ocean Systems

PAN & TILT ASSEMBLY
PT-10-AC-AIR-SS

SIZE	CAGE CODE	DWG NO.	REV LTR
C	2T637	21-00001	H

SCALE 1/1 | WEIGHT | SHEET 1 OF 1

2. ASSY TO CONFORM TO ROS PROCEDURES 98-10025, 98-10026 & 98-10027.
1. REF: WIRING DIAGRAM 21-00003.

NOTES (UNLESS OTHERWISE SPECIFIED)

PARTS LIST	RemoteOceanSystems	CAGE CODE 2T637	PL 2100001	REV H
QUANTITY REQD	TITLE PAN & TILT ASSY – PT-10-AC-AIR-SS	SHT 1 OF 4	DATE 5-30-00	

-04	-03	-02	-01	ITEM NO.	PART NO.	DESCRIPTION	REMARKS
			X		21-00001-01	PAN & TILT ASSY – 304 SS VERSION	– OBSOLETE
		X			21-00001-02	PAN & TILT ASSY – 304 SS VERSION	– OBSOLETE
	X				21-00001-03	PAN & TILT ASSY – 120VAC 60Hz, SS	LPMBH-5MP CONN
X					21-00001-04	PAN & TILT ASSY – 120VAC 50Hz, SS	LPMBH-5MP CONN
				1			
				2			
	2			3	21-03187-01	MOTOR ASSY – 120VAC, 60HZ	
2	2			4	21-00100-01	MOTOR PLATE	
				5			
				6			
2	2			7	21-00120-01	BRONZE BEARING	
2	2			8	21-00180-01	LOCKING PIN	
				9			
2				10	21-03199-01	MOTOR ASSY – 120VAC, 50HZ	
				11			
2	2			12	21-02020-4	HARMONIC GEAR SET 88:1	
1	1			13	60-01080-4	CONNECTOR, 5 PIN	LPMBH-5-MP
1	1			14	60-04090-4	NUT, CONN	
2	2			15	21-02040-4	THRUST WASHER	
2	2			16	60-24214-4	QUAD-RING SEAL	
1	1			17	60-20215-4	O-RING SEAL	
3	3			18	60-20140-4	O-RING SEAL	
2	2			19	21-02070-4	RETAINING RING	
2	2			20	21-02080-4	RETAINING RING	
4	4			21	21-02090-4	RETAINING RING	

PARTS LIST	RemoteOceanSystems	CAGE CODE 27637	PL 2100001	REV H
QUANTITY REQD	TITLE PAN & TILT ASSY - PT-10-AC-AIR-SS		SHT 2 OF 4	DATE 5-30-00

-04	-03	-02	-01	ITEM NO.	PART NO.	DESCRIPTION	REMARKS
2	2			22	21-02100-4	RETAINING RING	
1	1			23	21-02110-4	RETAINING RING	
4	4			24	62-20012-4	SEAL SCR, #10-32 X .25 LG	
12	12			25	62-00241-4	FLT HD SCR, M3 X 8 LG	SST
12	12			26	62-00242-4	FLT HD SCR, M3 X 10 LG	SST
6	6			27	62-00157-4	FLT HD SCR, #8-32 X .375 LG	SST
4	4			28	62-20133-4	SOC HD CAP SCR, .250-20 X .50 LG	316 SST
2	2			29	21-00074-01	BUTTON HD SCR, MOD - AID	
REF	REF			30	21-00029	TEST PROCEDURE	
REF	REF			31	21-00003	WIRING DIAGRAM	
1	1			32	21-00019	MANUAL	
1	1			33		LABEL, 120VAC	
1	1			34		LABEL, ID	
1	1			35		LABEL, LOGO	
1	1			36		PROTECTIVE COVER, CLEAR, ID LABEL	
1	1			37		PROTECTIVE COVER, CLEAR, VOLTAGE LABEL	
1	1			38	21-01021-01	HARDWARE KIT, PT-10 SERIES POSITIONERS	
1	1			39	21-00015-02	HOUSING - 316 SS	
1	1			40	21-00085-02	REAR PLUG - 316 SS	
2	2			41	21-00055-02	END CAP - 316 SS	
2	2			42	21-00115-02	OUTPUT SHAFT - 316 SS	
1	1			43	21-00145-02	ADAPTER PLATE, CONN - 316 SS	
				44	60-01068-4	CONNECTOR, 5 PIN	MHDG-5-BCR
				45	60-01069-4	CONNECTOR, 5 PIN	MSSJ-5-BCR
				46	21-00137-01	ADAPTER PLATE, CONN - 316 SS	
				47	52-20026-01	NUT, CONN	

PARTS LIST	RemoteOceanSystems	CAGE CODE 2T637	PL 2100001	REV H
QUANTITY REQD	TITLE PAN & TILT ASSY - PT-10-AC-AIR-SS		SHT 3 OF 4	DATE 5-30-00

-08	-07	-06	-05	ITEM NO.	PART NO.	DESCRIPTION	REMARKS
			X		21-00001-05	PAN & TILT ASSY - 120VAC 60Hz, SS,	MSSJ-5-BCR CONN
		X			21-00001-06	PAN & TILT ASSY - 120VAC 50Hz, SS,	MSSJ-5-BCR CONN
	X				21-00001-07	PAN & TILT ASSY - 120VAC 60Hz, SS,	MHDG-5-BCR CONN
				1			
				2			
	2		2	3	21-03187-01	MOTOR ASSY - 120VAC, 60HZ	
	2	2	2	4	21-00100-01	MOTOR PLATE	
				5			
				6			
	2	2	2	7	21-00120-01	BRONZE BEARING	
	2	2	2	8	21-00180-01	LOCKING PIN	
				9			
		2		10	21-03199-01	MOTOR ASSY - 120VAC, 50HZ	
				11			
	2	2	2	12	21-02020-4	HARMONIC GEAR SET 88:1	
				13	60-01080-4	CONNECTOR, 5 PIN	LPMBH-5-MP
				14	60-04090-4	NUT, CONN	
	2	2	2	15	21-02040-4	THRUST WASHER	
	2	2	2	16	60-24214-4	QUAD-RING SEAL	
	1	1	1	17	60-20215-4	O-RING SEAL	
	3	3	3	18	60-20140-4	O-RING SEAL	
	2	2	2	19	21-02070-4	RETAINING RING	
	2	2	2	20	21-02080-4	RETAINING RING	
	4	4	4	21	21-02090-4	RETAINING RING	

PARTS LIST	RemoteOceanSystems	CAGE CODE 2T637	PL 2100001	REV H
QUANTITY REQD	TITLE PAN & TILT ASSY - PT-10-AC-AIR-SS		SHT 4 OF 4	DATE 5-30-00

-08	-07	-06	-05	ITEM NO.	PART NO.	DESCRIPTION	REMARKS
	2	2	2	22	21-02100-4	RETAINING RING	
	1	1	1	23	21-02110-4	RETAINING RING	
	4	4	4	24	62-20012-4	SEAL SCR, #10-32 X .25 LG	
	12	12	12	25	62-00241-4	FLT HD SCR, M3 X 8 LG	SST
	12	12	12	26	62-00242-4	FLT HD SCR, M3 X 10 LG	SST
	6	6	6	27	62-00157-4	FLT HD SCR, #8-32 X .375 LG	SST
	4	4	4	28	62-20133-4	SOC HD CAP SCR, .250-20 X .50 LG	316 SST
	2	2	2	29	21-00074-01	BUTTON HD SCR, MOD - AID	
	REF	REF	REF	30	21-00029	TEST PROCEDURE	
	REF	REF	REF	31	21-00003	WIRING DIAGRAM	
	1	1	1	32	21-00019	MANUAL	
	1	1	1	33		LABEL, 120VAC	
	1	1	1	34		LABEL, ID	
	1	1	1	35		LABEL, LOGO	
	1	1	1	36		PROTECTIVE COVER, CLEAR, ID LABEL	
	1	1	1	37		PROTECTIVE COVER, CLEAR, VOLTAGE LABEL	
	1	1	1	38	21-01021-01	HARDWARE KIT, PT-10 SERIES POSITIONERS	
	1	1	1	39	21-00015-02	HOUSING - 316 SS	
	1	1	1	40	21-00085-02	REAR PLUG - 316 SS	
	2	2	2	41	21-00055-02	END CAP - 316 SS	
	2	2	2	42	21-00115-02	OUTPUT SHAFT - 316 SS	
				43	21-00145-02	ADAPTER PLATE, CONN - 316 SS	
	1			44	60-01068-4	CONNECTOR, 5 PIN	MHDG-5-BCR
		1	1	45	60-01069-4	CONNECTOR, 5 PIN	MSSJ-5-BCR
	1	1	1	46	21-00137-01	ADAPTER PLATE, CONN - 316 SS	
	1	1	1	47	52-20026-01	NUT, CONN	

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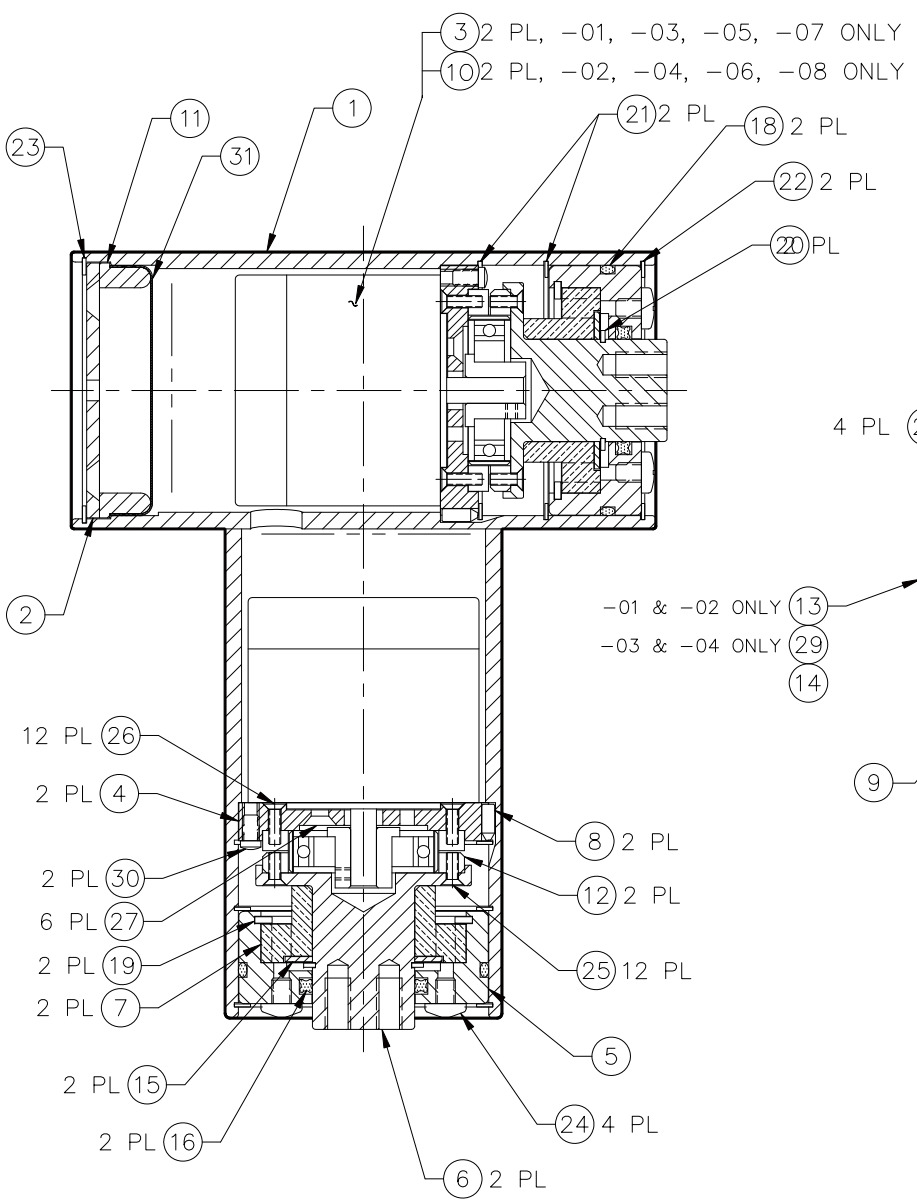
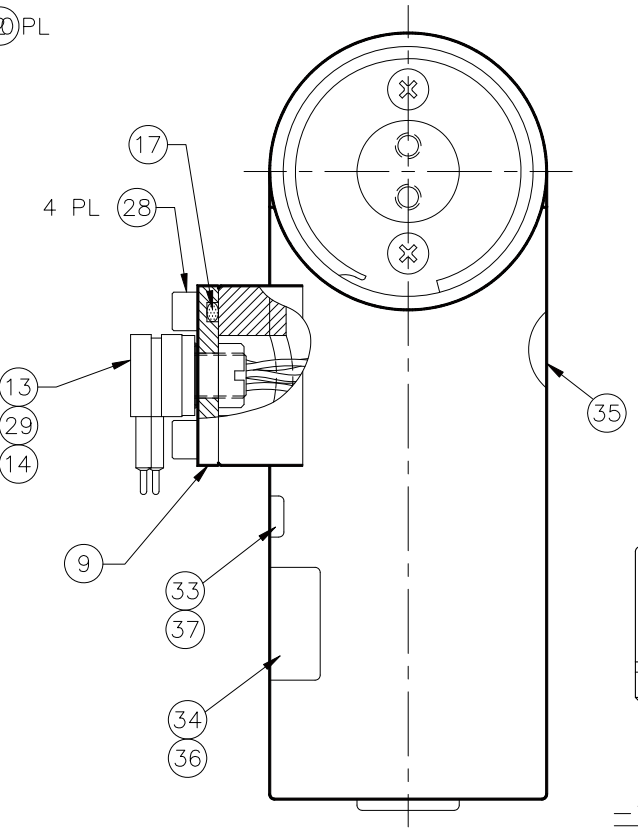
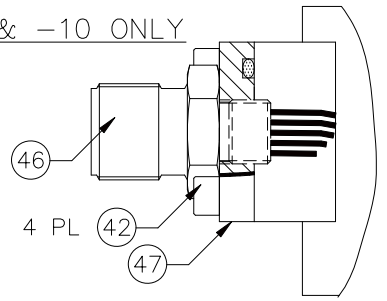
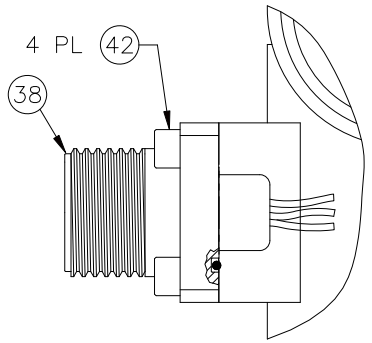
REV	DESCRIPTION		DATE
A	ITEM 31 WAS 21-02030-4 & DELETED NOTE 3		11-5-98
B	UPDATED AND ADDED -03 & -04	GA	4-17-00
C	SEE ECO NO. 113	GTA	7-14-00
D	SEE ECO NO. 576	GTA	3-25-02
E	ADDED ITEM 30 & UDTD NOTES.	gta	4-2-03
F	ADDED -07 & -08 CONFG	rjl	16DEC04
G	ADDED 09, 10 CONFG & ECR 1114	rjl	17FEB06
H	SEE ECO No 950.	gta	4MAY07
J	SEE EC-00114	SW	08APR09
K	SEE EC-00421	SW	07JAN10

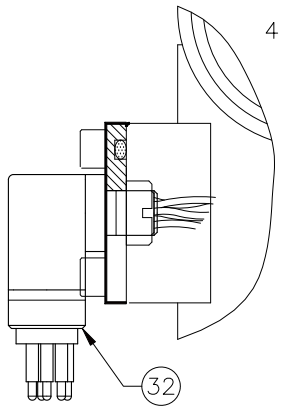




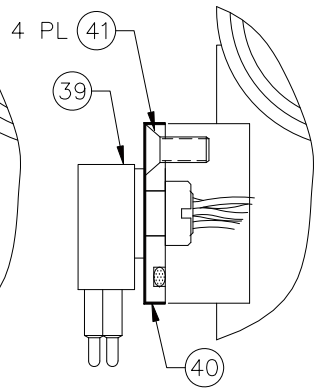




-07 & -08 ONLY



-11 & -12 ONLY



-05 & -06 ONLY

SEE SEPARATE PARTS LIST PL2101000

-03 QTY/ASSY	-02 QTY/ASSY	-01 QTY/ASSY	ITEM NO.	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION

NEXT ASSEMBLY: END ITEM

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES

TOLERANCES
.X = +/- .030
.XX = +/- .010
.XXX = +/- .005
ANGULAR +/- 30'

SURFACE TEXTURE: $\sqrt{}$

PREPARED	GTA	9-8-97
CHECKED	S. Scott	4-17-00
QA	Rick L.	4-18-00
RELEASED BY	B. Hulburd	

RemoteOceanSystems

PAN & TILT ASSEMBLY
PT-10-110AC-OIL-AL

SIZE	CAGE CODE	DWG NO.	REV LTR
C	2T637	21-01000	K

SCALE 1/1 | WEIGHT | SHEET 1 OF 1

2. ASSY TO CONFORM TO ROS PROCEDURES 98-10026, 98-10027 & 98-10202.
1. REF: WIRING DIAGRAM 21-00003.

NOTES (UNLESS OTHERWISE SPECIFIED)

PARTS LIST	RemoteOceanSystems	CAGE CODE 2T637	PL 2101000	REV K
QUANTITY REQD	TITLE PAN & TILT ASSY - PT-10-AC-OIL-AL		SHT 1 OF 9	DATE 4-17-00

-04	-03	-02	-01	ITEM NO.	PART NO.	DESCRIPTION	REMARKS
			X		21-01000-01	PAN & TILT ASSY - 120VAC 60Hz, LPMBH-5-MP CONN	
		X			21-01000-02	PAN & TILT ASSY - 120VAC 50Hz, LPMBH-5-MP CONN	
	X				21-01000-03	PAN & TILT ASSY - 120VAC 60Hz, FAWL-5P-BC-R/A CONN	
X					21-01000-04	PAN & TILT ASSY - 120VAC 50Hz, FAWL-5P-BC-R/A CONN	
1	1	1	1	1	21-00010-01	HOUSING	
1	1	1	1	2	21-00070-01	COVER, COMP	
	2		2	3	21-03187-01	MOTOR ASSY - 120VAC, 60HZ	
2	2	2	2	4	21-00100-01	MOTOR PLATE	
2	2	2	2	5	21-00050-01	END CAP	
2	2	2	2	6	21-00110-01	OUTPUT SHAFT	
2	2	2	2	7	21-00120-01	BRONZE BEARING	
2	2	2	2	8	21-00180-01	LOCKING PIN	
1	1	1	1	9	21-00140-01	ADAPTER PLATE, CONN	
2		2		10	21-03199-01	MOTOR ASSY - 120VAC, 50Hz	
1	1	1	1	11	21-00060-01	PLUG, COMP	
2	2	2	2	12	21-02020-4	HARMONIC GEAR SET 88:1	
		1	1	13	60-01080-4	CONNECTOR, 5 PIN	LPMBH-5-MP
1	1	1	1	14	60-04090-4	NUT, CONN	
2	2	2	2	15	21-02040-4	THRUST WASHER	
2	2	2	2	16	60-24214-4	QUAD-RING SEAL	
1	1	1	1	17	60-20215-4	O-RING SEAL	
2	2	2	2	18	60-20140-4	O-RING SEAL	
2	2	2	2	19	21-02070-4	RETAINING RING	
2	2	2	2	20	21-02080-4	RETAINING RING	
4	4	4	4	21	21-02090-4	RETAINING RING	

PARTS LIST	RemoteOceanSystems	CAGE CODE 2T637	PL 2101000	REV K
QUANTITY REQD	TITLE PAN & TILT ASSY - PT-10-AC-OIL-AL		SHT 2 OF 9	DATE 4-17-00

QUANTITY REQD				ITEM NO.	PART NO.	DESCRIPTION	REMARKS
-04	-03	-02	-01				
2	2	2	2	22	21-02100-4	RETAINING RING	
1	1	1	1	23	21-02110-4	RETAINING RING	
4	4	4	4	24	62-20012-4	SEAL SCR, #10-32 X .25 LG	
12	12	12	12	25		FLT HD SCR, M3 X 8 LG	SST
12	12	12	12	26		FLT HD SCR, M3 X 10 LG	SST
6	6	6	6	27		FLT HD SCR, #8-32 X .375 LG	SST
4	4	4	4	28	62-20133-4	SOC HD CAP SCR, .250-20 X .50 LG	316 SST
1	1			29	60-11030-4	CONN, 5 PIN	FAWL-5P-BC-R/A-1/2
2	2	2	2	30	21-00074-01	BUTTON HD SCR, MOD - AID	
1	1	1	1	31	21-02031-01	BELLOFRAM, MOD - AID	
				32	60-01013-4	CONN, 8 PIN	MCBHRA8M-1/2
1	1	1	1	33		LABEL, 120VAC	
1	1	1	1	34		LABEL, ID	
1	1	1	1	35		LABEL, LOGO	
1	1	1	1	36		PROTECTIVE COVER, CLEAR, ID LABEL	
1	1	1	1	37		PROTECTIVE COVER, CLEAR, VOLTAGE LABEL	
				38	60-04078-4	CONN, 6 PIN	5506-2006
				39	60-04102-4	CONN, 5 PIN	LPBH-5-MP-1/2
				40	21-00142-01	ADAPTER PLATE, CONN	
				41	62-20179-4	FLT HD SOC SCR, .250-20 X .50 LG	316 SST
				42	62-20104-4	SOC HD CAP SCR, .250-20 X .625 LG	316 SST
1	1	1	1	43	21-00019	MANUAL	
REF	REF	REF	REF	44	21-00029	TEST PROCEDURE	
REF	REF	REF	REF	45	21-00003	WIRE DIAGRAM	
				46	60-01085-4	CONN, 8 PIN	5507-1508-BCR
				47	21-00144-01	ADAPTER PLATE, CONN	

PARTS LIST	RemoteOceanSystems	CAGE CODE 2T637	PL 2101000	REV K
QUANTITY REQD	TITLE PAN & TILT ASSY - PT-10-AC-OIL-AL		SHT 3 OF 9	DATE 4-17-00

-04	-03	-02	-01	ITEM NO.	PART NO.	DESCRIPTION	REMARKS
1	1	1	1	48	21-01021-01	HARDWARE KIT, PT-10	
				49			
				50			
				51			
				52			
				53			
				54			
				55			
				56			
				57			
				58			
				59			
				60			
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				68			
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				70			
				71			
				72			
				73			

PARTS LIST	RemoteOceanSystems	CAGE CODE 2T637	PL 2101000	REV K

QUANTITY REQD				TITLE PAN & TILT ASSY - PT-10-AC-OIL-AL			SHT 4 OF 9	DATE 7-13-00
-08	-07	-06	-05	ITEM NO.	PART NO.	DESCRIPTION	REMARKS	
			X		21-01000-05	PAN & TILT ASSY - 120VAC 60Hz, LPBH-5-MP CONN		
		X			21-01000-06	PAN & TILT ASSY - 120VAC 50Hz, LPBH-5-MP CONN		
	X				21-01000-07	PAN & TILT ASSY - 120VAC 60Hz, 5506-2006 CONN		
X					21-01000-08	PAN & TILT ASSY - 120VAC 50Hz, 5506-2006 CONN		
1	1	1	1	1	21-00010-01	HOUSING		
1	1	1	1	2	21-00070-01	COVER, COMP		
	2		2	3	21-03187-01	MOTOR ASSY - 120VAC, 60HZ		
2	2	2	2	4	21-00100-01	MOTOR PLATE		
2	2	2	2	5	21-00050-01	END CAP		
2	2	2	2	6	21-00110-01	OUTPUT SHAFT		
2	2	2	2	7	21-00120-01	BRONZE BEARING		
2	2	2	2	8	21-00180-01	LOCKING PIN		
				9	21-00140-01	ADAPTER PLATE, CONN		
2		2		10	21-03199-01	MOTOR ASSY - 120VAC, 50Hz		
1	1	1	1	11	21-00060-01	PLUG, COMP		
2	2	2	2	12	21-02020-4	HARMONIC GEAR SET 88:1		
				13	60-01080-4	CONNECTOR, 5 PIN	LPMBH-5-MP	
		1	1	14	60-04090-4	NUT, CONN		
2	2	2	2	15	21-02040-4	THRUST WASHER		
2	2	2	2	16	60-24214-4	QUAD-RING SEAL		
		1	1	17	60-20215-4	O-RING SEAL		
2	2	2	2	18	60-20140-4	O-RING SEAL		
2	2	2	2	19	21-02070-4	RETAINING RING		
2	2	2	2	20	21-02080-4	RETAINING RING		
4	4	4	4	21	21-02090-4	RETAINING RING		

PARTS LIST	RemoteOceanSystems	CAGE CODE 2T637	PL 2101000	REV K

QUANTITY REQD				TITLE PAN & TILT ASSY - PT-10-AC-OIL-AL			SHT 5 OF 9	DATE 7-13-00
-08	-07	-06	-05	ITEM NO.	PART NO.	DESCRIPTION	REMARKS	
2	2	2	2	22	21-02100-4	RETAINING RING		
1	1	1	1	23	21-02110-4	RETAINING RING		
4	4	4	4	24	62-20012-4	SEAL SCR, #10-32 X .25 LG		
12	12	12	12	25		PHI FLT HD SCR, M3 X 8 LG	SST	
12	12	12	12	26		PHI FLT HD SCR, M3 X 10 LG	SST	
6	6	6	6	27		PHI FLT HD SCR, #8-32 X .375 LG	SST	
				28	62-20133-4	SOC HD CAP SCR, .250-20 X .50 LG	316 SST	
				29	60-11030-4	CONN, 5 PIN	FAWL-5P-BC-R/A-1/2	
2	2	2	2	30	21-00074-01	BUTTON HD SCR, MOD - AID		
1	1	1	1	31	21-02031-01	BELLOFRAM, MOD - AID		
				32	60-01013-4	CONN, 8 PIN	MCBHRA8M-1/2	
1	1	1	1	33		LABEL, 120VAC		
1	1	1	1	34		LABEL, ID		
1	1	1	1	35		LABEL, LOGO		
1	1	1	1	36		PROTECTIVE COVER, CLEAR, ID LABEL		
1	1	1	1	37		PROTECTIVE COVER, CLEAR, VOLTAGE LABEL		
1	1			38	60-04078-4	CONN, 6 PIN	5506-2006	
		1	1	39	60-04102-4	CONN, 5 PIN	LPBH-5-MP-1/2	
		1	1	40	21-00142-01	ADAPTER PLATE, CONN		
		4	4	41	62-20179-4	FLT HD SOC SCR, .250-20 X .50 LG	316 SST	
4	4			42	62-20104-4	SOC HD CAP SCR, .250-20 X .625 LG	316 SST	
1	1	1	1	43	21-00019	MANUAL		
REF	REF	REF	REF	44	21-00029	TEST PROCEDURE		
REF	REF	REF	REF	45	21-00003	WIRE DIAGRAM		
				46	60-01085-4	CONN, 8 PIN	5507-1508-BCR	
				47	21-00144-01	ADAPTER PLATE, CONN		

PARTS LIST	RemoteOceanSystems	CAGE CODE 2T637	PL 2101000	REV K
QUANTITY REQD	TITLE PAN & TILT ASSY - PT-10-AC-OIL-AL		SHT 6 OF 9	DATE 4-17-00

-08	-07	-06	-05	ITEM NO.	PART NO.	DESCRIPTION	REMARKS
1	1	1	1	48	21-01021-01	HARDWARE KIT, PT-10	
				49			
				50			
				51			
				52			
				53			
				54			
				55			
				56			
				57			
				58			
				59			
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				70			
				71			
				72			
				73			

PARTS LIST	RemoteOceanSystems	CAGE CODE 2T637	PL 2101000	REV K
QUANTITY REQD	TITLE PAN & TILT ASSY - PT-10-AC-OIL-AL		SHT 7 OF 9	DATE 7-13-00

-12	-11	-10	-09	ITEM NO.	PART NO.	DESCRIPTION	REMARKS
			X		21-01000-09	PAN & TILT ASSY - 120VAC 60Hz, 5507-1508-BCR CONN	
		X			21-01000-10	PAN & TILT ASSY - 120VAC 50Hz, 5507-1508-BCR CONN	
	X				21-01000-11	PAN & TILT ASSY - 120VAC 60Hz, MCBHRA8M1/2 CONN	
X					21-01000-12	PAN & TILT ASSY - 120VAC 50Hz, MCBHRA8M1/2 CONN	
1	1	1	1	1	21-00010-01	HOUSING	
1	1	1	1	2	21-00070-01	COVER, COMP	
	2		2	3	21-03187-01	MOTOR ASSY - 120VAC, 60HZ	
2	2	2	2	4	21-00100-01	MOTOR PLATE	
2	2	2	2	5	21-00050-01	END CAP	
2	2	2	2	6	21-00110-01	OUTPUT SHAFT	
2	2	2	2	7	21-00120-01	BRONZE BEARING	
2	2	2	2	8	21-00180-01	LOCKING PIN	
1	1			9	21-00140-01	ADAPTER PLATE, CONN	
2		2		10	21-03199-01	MOTOR ASSY - 120VAC, 50Hz	
1	1	1	1	11	21-00060-01	PLUG, COMP	
2	2	2	2	12	21-02020-4	HARMONIC GEAR SET 88:1	
				13	60-01080-4	CONNECTOR, 5 PIN	LPMBH-5-MP
1	1			14	60-04090-4	NUT, CONN	
2	2	2	2	15	21-02040-4	THRUST WASHER	
2	2	2	2	16	60-24214-4	QUAD-RING SEAL	
1	1	1	1	17	60-20215-4	O-RING SEAL	
2	2	2	2	18	60-20140-4	O-RING SEAL	
2	2	2	2	19	21-02070-4	RETAINING RING	
2	2	2	2	20	21-02080-4	RETAINING RING	
4	4	4	4	21	21-02090-4	RETAINING RING	

PARTS LIST	RemoteOceanSystems	CAGE CODE 2T637	PL 2101000	REV K
QUANTITY REQD	TITLE PAN & TILT ASSY - PT-10-AC-OIL-AL		SHT 8 OF 9	DATE 7-13-00

QUANTITY REQD				ITEM NO.	PART NO.	DESCRIPTION	REMARKS
-12	-11	-10	-09				
2	2	2	2	22	21-02100-4	RETAINING RING	
1	1	1	1	23	21-02110-4	RETAINING RING	
4	4	4	4	24	62-20012-4	SEAL SCR, #10-32 X .25 LG	
12	12	12	12	25		PHI FLT HD SCR, M3 X 8 LG	SST
12	12	12	12	26		PHI FLT HD SCR, M3 X 10 LG	SST
6	6	6	6	27		PHI FLT HD SCR, #8-32 X .375 LG	SST
4	4			28	62-20133-4	SOC HD CAP SCR, .250-20 X .50 LG	316 SST
				29	60-11030-4	CONN, 5 PIN	FAWL-5P-BC-R/A-1/2
2	2	2	2	30	21-00074-01	BUTTON HD SCR, MOD - AID	
1	1	1	1	31	21-02031-01	BELLOFRAM, MOD - AID	
1	1			32	60-01013-4	CONN, 8 PIN	MCBHRA8M-1/2
1	1	1	1	33		LABEL, 120VAC	
1	1	1	1	34		LABEL, ID	
1	1	1	1	35		LABEL, LOGO	
1	1	1	1	36		PROTECTIVE COVER, CLEAR, ID LABEL	
1	1	1	1	37		PROTECTIVE COVER, CLEAR, VOLTAGE LABEL	
				38	60-04078-4	CONN, 6 PIN	5506-2006
				39	60-04102-4	CONN, 5 PIN	LPBH-5-MP-1/2
				40	21-00142-01	ADAPTER PLATE, CONN	
				41	62-20179-4	FLT HD SOC SCR, .250-20 X .50 LG	316 SST
		4	4	42	62-20104-4	SOC HD CAP SCR, .250-20 X .625 LG	316 SST
1	1	1	1	43	21-00019	MANUAL	
REF	REF	REF	REF	44	21-00029	TEST PROCEDURE	
REF	REF	REF	REF	45	21-00003	WIRE DIAGRAM	
		1	1	46	60-01085-4	CONN, 8 PIN	5507-1508-BCR
		1	1	47	21-00144-01	ADAPTER PLATE, CONN	

PARTS LIST	RemoteOceanSystems	CAGE CODE 2T637	PL 2101000	REV K
QUANTITY REQD	TITLE PAN & TILT ASSY - PT-10-AC-OIL-AL		SHT 9 OF 9	DATE 4-17-00

-12	-11	-10	-09	ITEM NO.	PART NO.	DESCRIPTION	REMARKS
1	1	1	1	48	21-01021-01	HARDWARE KIT, PT-10	
				49			
				50			
				51			
				52			
				53			
				54			
				55			
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				73			

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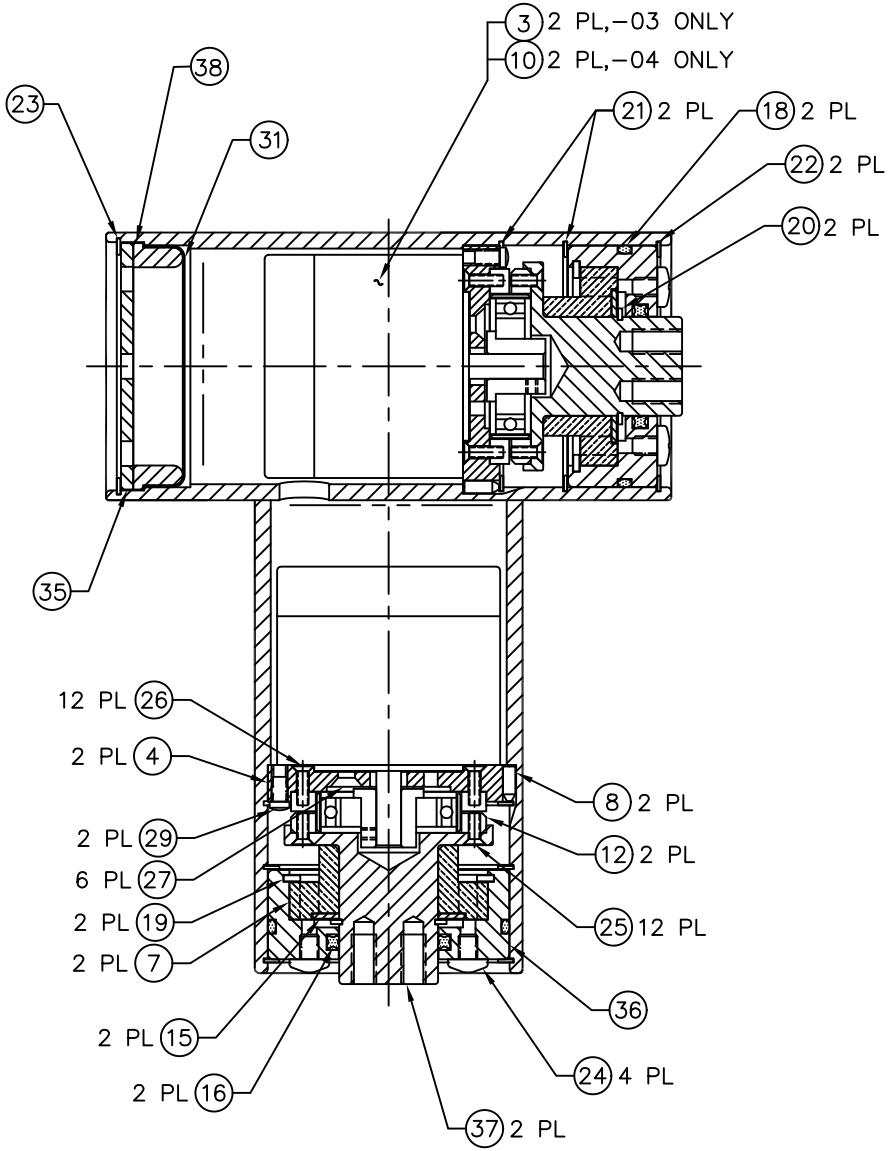
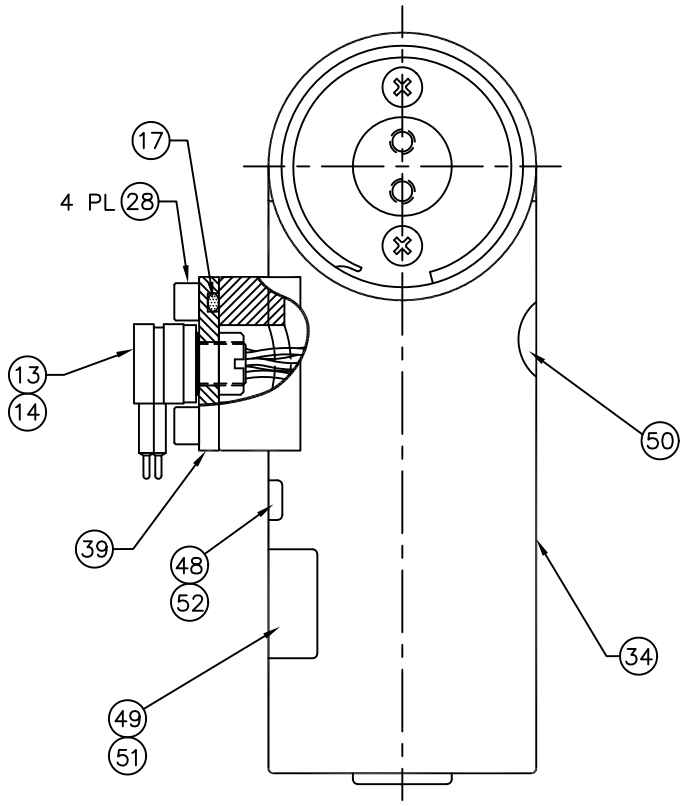
THIS DRAWING, PRINT OR DOCUMENT IS SUBMITTED IN CONFIDENCE FOR CONSIDERATION BY THE RECEIPIENT ALONE UNLESS PERMISSION FOR FURTHER DISCLOSURE IS EXPRESSLY GRANTED IN WRITING BY ROS, INC.

REV	DESCRIPTION		DATE
A	ITEM 31 WAS 21-02030-4 & DELETED NOTE 3		11-5-98
B	SEE ECO NO. 712	SM	10/8/02
C	CHANGED ITEM #24, IS: 62-20012-4, WAS: (FREE STOCK), SEAL SCR, 10-32 X .38 LG, REF: ECR NO. 752.	SM	12/18/02
D	ADDED ITEM 29 & UDTD NOTES.	gta	4-2-03
E	SEE ECO No 951.	gta	4MAY07
F	SEE ECN EC-00164	NBB	11 MAY 09





SEE SEPARATE PARTS LIST PL2101001

-03	-02	-01	ITEM NO.	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION
QTY/ASSY						

NEXT ASSEMBLY: END ITEM

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES

TOLERANCES
.X = +/- .030
.XX = +/- .010
.XXX = +/- .005
ANGULAR +/- 30'

SURFACE TEXTURE: $\sqrt{}$

PREPARED	GTA	9-9-97
CHECKED		
QA		
RELEASED BY		

RemoteOceanSystems

PAN & TILT ASSEMBLY
PT-10-120VAC-OIL - STAINLESS

SIZE	CAGE CODE	DWG NO.	REV LTR
C	2T637	21-01001	F

SCALE 1/1 | WEIGHT | SHEET 1 OF 1

2. ASSY TO CONFORM TO ROS PROCEDURES 98-10026, 98-10027 AND 98-10202.
1. REF: WIRING DIAGRAM 21-00003.

NOTES (UNLESS OTHERWISE SPECIFIED)

PARTS LIST	Remote Ocean Systems	CAGE CODE 2T637	PL 2101001	REV F
QUANTITY REQD	TITLE PT-10 ASSY, 120VAC-OIL-SS		SHT 1 OF 3	DATE 10/8/02

-04	-03	-02	-01	ITEM NO.	PART NO.	DESCRIPTION	REMARKS
					21-01001-01	DELETED	
					21-01001-02	DELETED	
	X				21-01001-03	ASSY, PT-10-120VAC-OIL-316SS, 60 Hz	
X					21-01001-04	ASSY, PT-10-120VAC-OIL-316SS, 50 Hz	
				1	21-00015-01	HOUSING, 304 SS	
				2	21-00075-01	COVER, COMP, 304 SS	
	2			3	21-03187-01	ASSY, MOTOR - 120VAC, 60Hz	
2	2			4	21-00100-01	MOTOR PLATE	
				5	21-00055-01	END CAP, 304 SS	
				6	21-00115-01	OUTPUT SHAFT, 304 SS	
2	2			7	21-00120-01	BRONZE BEARING	
2	2			8	21-00180-01	LOCKING PIN	
				9	21-00145-01	ADAPTER PLATE, CONN, 304 SS	
2				10	21-03199-01	ASSY, MOTOR - 120VAC, 50Hz	
				11	21-00065-01	PLUG, COMP, 304SS	
2	2			12	21-02020-4	HARMONIC GEAR SET, 88:1	
1	1			13	60-01080-4	CONNECTOR, 5PIN	
1	1			14	60-04090-4	NUT, CONN	
2	2			15	21-02040-4	THRUST WASHER	
2	2			16	60-24214-4	QUAD-RING SEAL	
1	1			17	60-20215-4	O-RING SEAL	
2	2			18	60-20140-4	O-RING SEAL	
2	2			19	21-02070-4	RETAINING RING	
2	2			20	21-02080-4	RETAINING RING	
4	4			21	21-02090-4	RETAINING RING	

PARTS LIST	Remote Ocean Systems	CAGE CODE 2T637	PL 2101001	REV F
QUANTITY REQD	TITLE PT-10 ASSY, 120VAC-OIL-SS		SHT 2 OF 3	DATE 10/8/02

-04	-03	-02	-01	ITEM NO.	PART NO.	DESCRIPTION	REMARKS
2	2			22	21-02100-4	RETAINING RING	
1	1			23	21-02110-4	RETAINING RING	
4	4			24	62-20012-4	SEAL SCR, #10-32 X .25 LG	
12	12			25		FLT HD SCR, M3 X 8	SST
12	12			26		FLT HD SCR, M3 X 10	SST
6	6			27		FLT HD SCR, #8-32 X .38 LG	SST
4	4			28	62-20133-4	SOC HD CAP SCR, .250-20 X .50 LG	316 SST
2	2			29	21-00074-01	BUTTON HD SCR, MOD - AID	
				30			
1	1			31	21-02031-01	BELLOFRAM, MOD - AID	
				32			
				33			
1	1			34	21-00015-02	HOUSING, 316 SS	
1	1			35	21-00075-02	COVER, COMP, 316 SS	
2	2			36	21-00055-02	END CAP, 316 SS	
2	2			37	21-00115-02	OUTPUT SHAFT, 316 SS	
1	1			38	21-00065-02	PLUG, COMP, 316 SS	
1	1			39	21-00145-02	ADAPTER, PLATE, CONN, 316 SS	
1	1			40	21-01021-01	HARDWARE KIT, PT-10 SERIES POSITIONERS	
1	1			41	21-00017-01	O-RING KIT	
REF	REF			42	21-00003	WIRING DIAGRAM	
1	1			43	21-00019	MANUAL	
REF	REF			44	21-00002	INSTALLATION/OUTLINE	
REF	REF			45	21-00029	TEST PROCEDURE	
				46			
				47			

PARTS LIST	Remote Ocean Systems	CAGE CODE 2T637	PL 2101001	REV F
QUANTITY REQD	TITLE PT-10 ASSY, 120VAC-OIL-SS		SHT 3 OF 3	DATE 10/8/02

-04	-03	-02	-01	ITEM NO.	PART NO.	DESCRIPTION	REMARKS
1	1			48		LABEL, 120VAC	
1	1			49		LABEL, ID	
1	1			50		LABEL, LOGO	
1	1			51		PROTECTIVE COVER, CLEAR, ID LABEL	
1	1			52		PROTECTIVE COVER, CLEAR, VOLTAGE LABEL	
				53			
				54			
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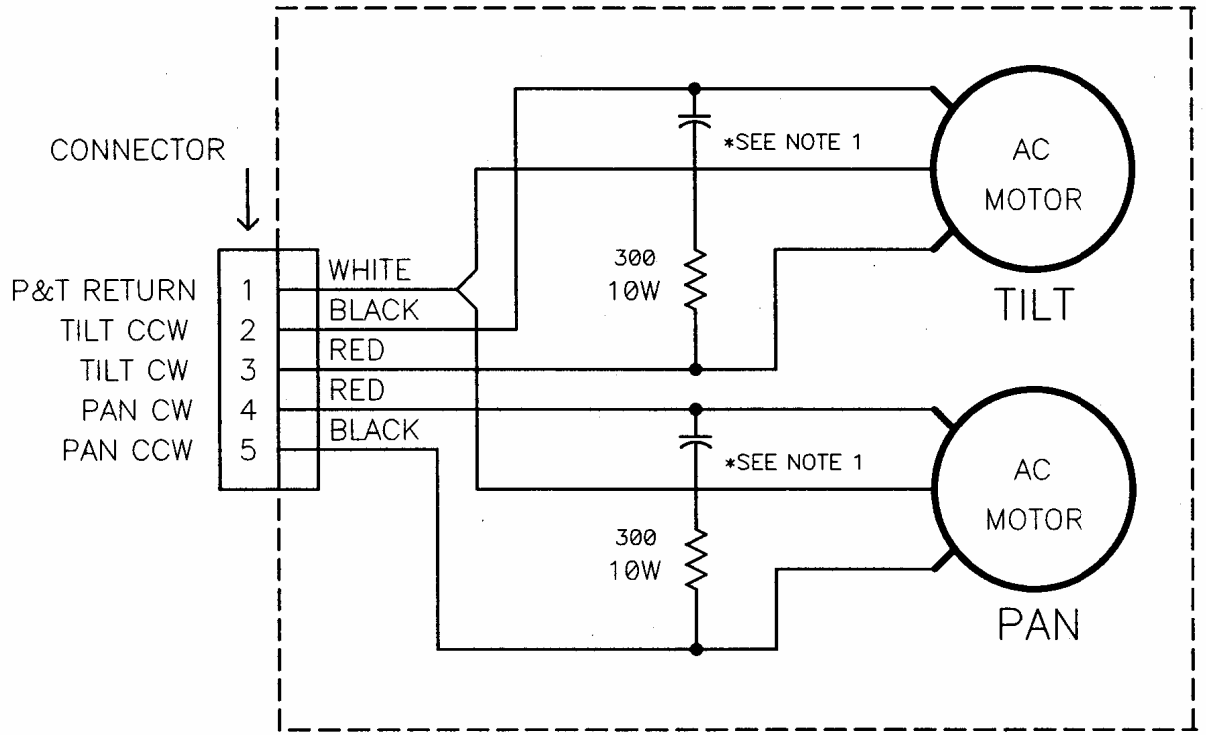
REV	DESCRIPTION	DATE	APPROVED
A	ORIGINAL RELEASE	AUG 96	
B	DELETED CONNECTOR DATA, REF ECO 751	MAY 03	

NOTES:

1. CAP IS 1.5uF, 200V FOR 60HZ ASSEMBLIES.
   CAP IS 2.0uF, 200V FOR 50HZ ASSEMBLIES.



DRAWN BY R. WARNER	DATE 30AUG96	Remote Ocean Systems 5618 Copley Drive San Diego, CA. 92111 USA
DESIGNER	DATE	
CHECKED BY	DATE	TITLE: WIRING, INTERNAL, PT-10 (AC)
QUALITY	DATE	
RELEASED	DATE	
CASE CODE NO. 2T637		SIZE A / NEXT ASSEMBLY 21-00000-0 / DWG NO 21-00003-0 / REV B SCALE / FILENAME 2100003B.S01 / SHEET 1 OF 1