General Description

The 3501BA is a medium duty, azimuth rotating system designed to rotate and hold large communication antenna arrays. It can be mounted in various positions on most towers. The entire mechanism is protected from weather by a ruggedly constructed housing.

The rotator is supplied complete. (The cable is not supplied.) The control unit includes an ON/OFF switch, directional rotation switch, and a selsyn operated, compass-rose indicator, calibrated in degrees for azimuth information. Mating control connectors are supplied for the rotator/indicator connection.

Specifications

Mechanical

Rotating torque .....9000 in. lbs.
Braking torque .....(in excess of) 23,000 in. lbs.
Maximum vertical load .....1000 lbs.
Maximum bending moment
at top bearing .....2000 ft. lbs. lateral thrust
Mast size range .....1-1/4" to 3"
Weight .....250 lbs.
Output shaft speed .....1 rpm
Size .....19" wide x 24" long x 14.5" high

Electrical

Power requirement, indicator..110/120 V, 50 - 60 cycle, 2 amp
Fuse, indicator .....3 AG, 3 amp
Power requirement, rotor .....110/120 V, 50 to 60 cycle;
220/240 V, 50 - 60 cycle, single phase
Fuse, rotor (110/120 VAC) .. Fusetron FNM-8 (cartridge)
Motor .....1/4 hp, single phase, 110/120 or 220/240 V
Control system .....manual with remote power relays
Indicating system .....Selsyn motor, 50 - 60 cycle, 110 120 V
Cable (indicator control) .... six-conductor, #16 AWG minimum
Positioning accuracy .....$\pm 5^0$

Unpacking

Remove the rotator and indicator from the shipping carton. Save the carton for any future shipping. Unpack the rotator and check it for damage. Remove the side panels and check for damage. Unpack the indicator and inspect for damage. This equipment has been carefully packed for safe arrival *if properly handled en route.*

The responsibility for safe delivery rests with the carrier. The responsibility for getting reimbursed for damage rests with *you.* Prompt action on your part will speed adjustments. Our warranty does not cover malfunction or damage which results from improper handling by a carrier. You should *not* return any merchandise to your dealer before filling out the necessary forms. To do so can jeopardize your investment and incur upon you the costs of necessary repairs. The system was fully tested prior to packing. It operated perfectly in all respects. However, after you are satisfied that there has been no mechanical damage during the shipment, we recommend bench testing of the system prior to installation to insure that no electrical damage has occurred.

Installations

Lubrication -

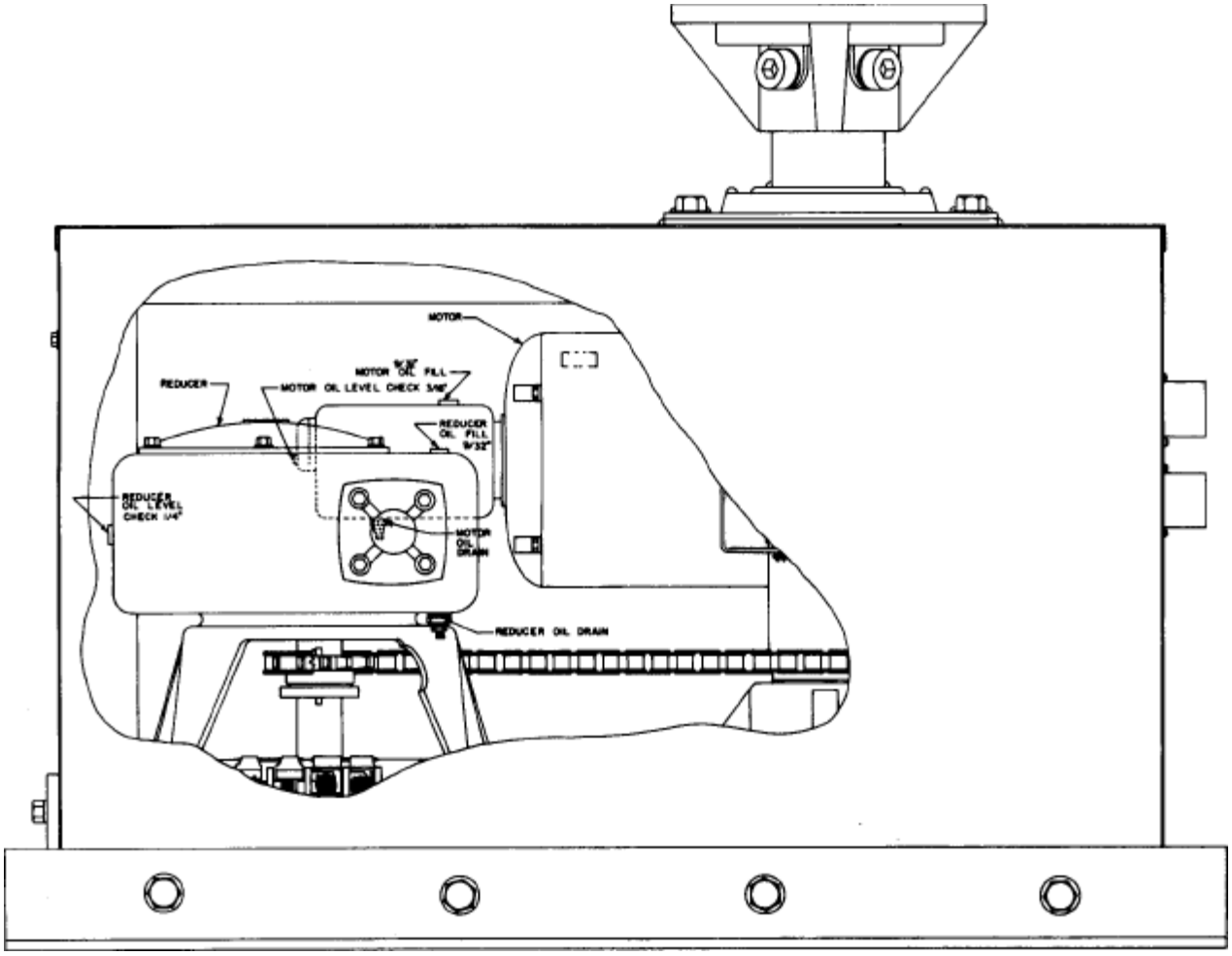
WARNING

The gear box is shipped dry. Do not operate without oil.

For normal operating conditions where surrounding temperatures are between 40 and 120 degrees Farenheit, "MOBILE Super Cylinder Oil 600W" or an oil of equal viscosity and composition is recommended. Below 40 degrees, this oil should be diluted with a lighter oil "SAE 30W Motor Oil" until the desired viscosity is obtained. Fill both sump units to the oil level mark and maintain this level. After the first 100 _hours of operation, drain the coil, flush out the case, and refill it to the proper level. Thereafter, under normal operating conditions, oil should be replaced at intervals of 1000 hours of operation.

The selsyn shaft on both selsyns should be oiled once a year on each end with two drops of light oil. *Do not use more than two drops.*

AA-3501-C-012



CAUTION

Both primary and secondary reducers have individual oil reservoirs. Each unit must be filled to and maintained at its individual oil level. For additional suitable oils, see the listing of Typical Manufacturer's Worm and Worm Gear Reducer Oils meeting A.G.M.A. Standards 250.02A.

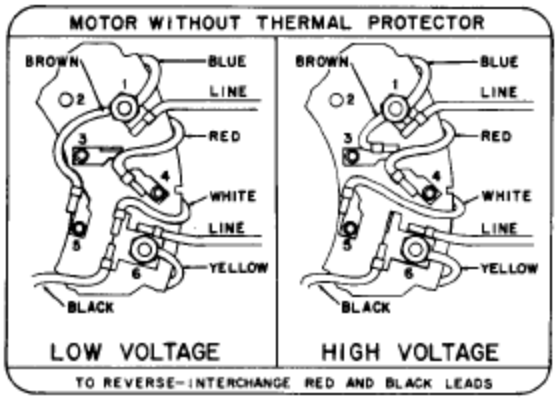
Cable Requirement -

Six wires are required to control the rotator and indicate its position. For best operation, the voltage drop should not exceed 2%. However, the rotator will operate with greater voltage drop with slight degradation of performance.

Belden #8621 seven conductor #16AWG cable can be used for runs up to and slightly exceeding 300 ft. (One conductor is unused.)

Cable connectors for attachment of the cable to the rotator and indicator are furnished with the system.

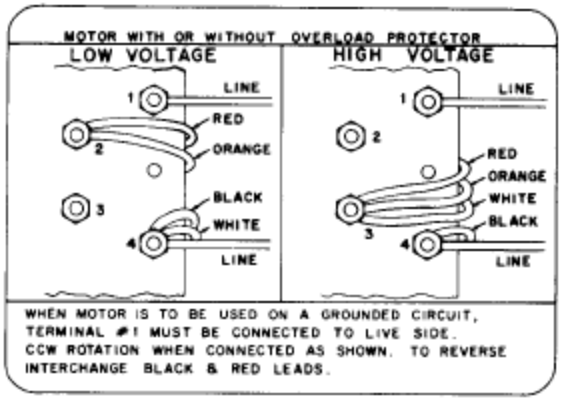
AA-03501-A-016



Motor Type #1 – CENTURY

Wire Harness from Relays	Motor Terminal (T) Board
brown	T#6
violet	T#1
orange	red
blue	black
red	T # 4
black	T #6

AA-3501-A-013



Motor Type #2 – CENTURY

Wire Harness from Relays	Motor Terminal (T) Board
brown	T#1
violet	T#4
orange	red
blue	black
red	T#3
black	T44

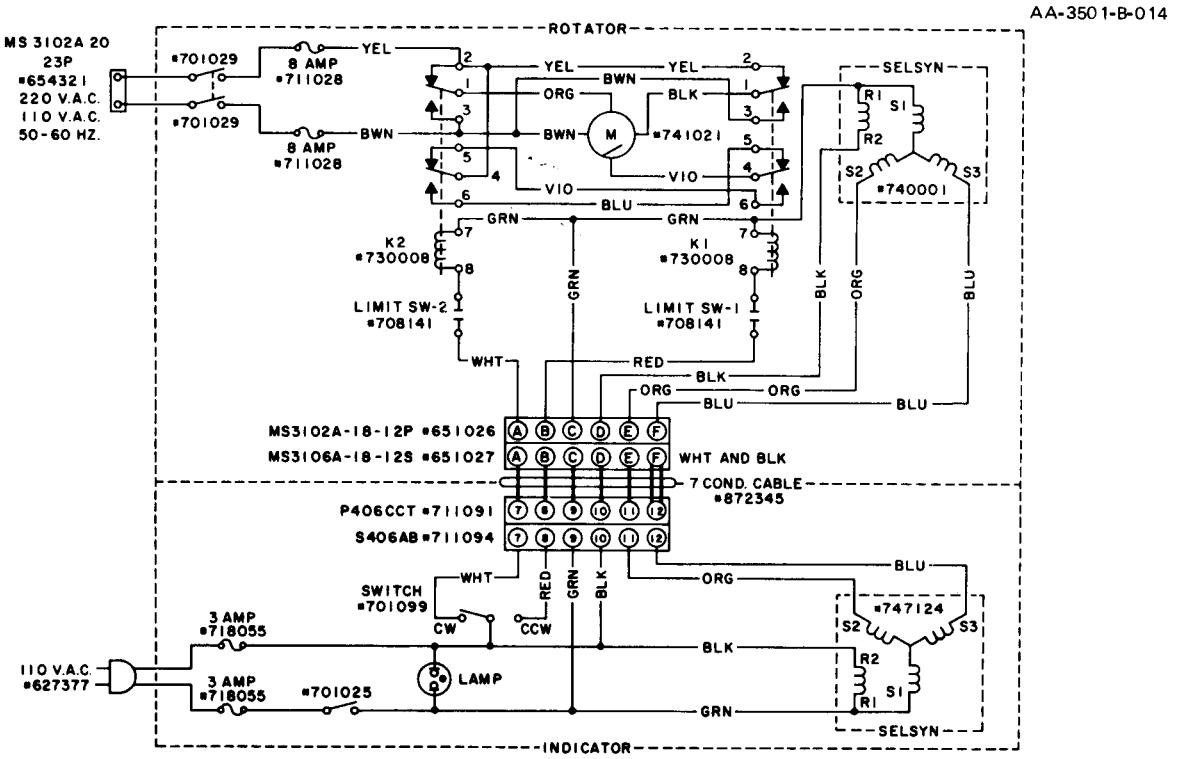
Power Requirements -

The indicator will operate only from 110/120 V, 50 - 60 cycle power. It is supplied with a power cord and wall plug which fits a standard outlet.

The rotator must be supplied either 110/120 VAC or 220/240 VAC single-phase power from a separate source independent of the indicator. This source should be both fused (30 amp) and switched or provided with 30-amp circuit breakers for 110/120 VAC operation. When operated from a 110/120 VAC source, run current is 4.2 amps, starting surge is 20 amps.

The power cable to the rotator should be a minimum of #12 AWG. A safety ground is also desirable. Maximum voltage drop to the rotator should be 2%. A greater voltage drop can be tolerated, but should not exceed 4%. Motor winding failure can result from overheating.

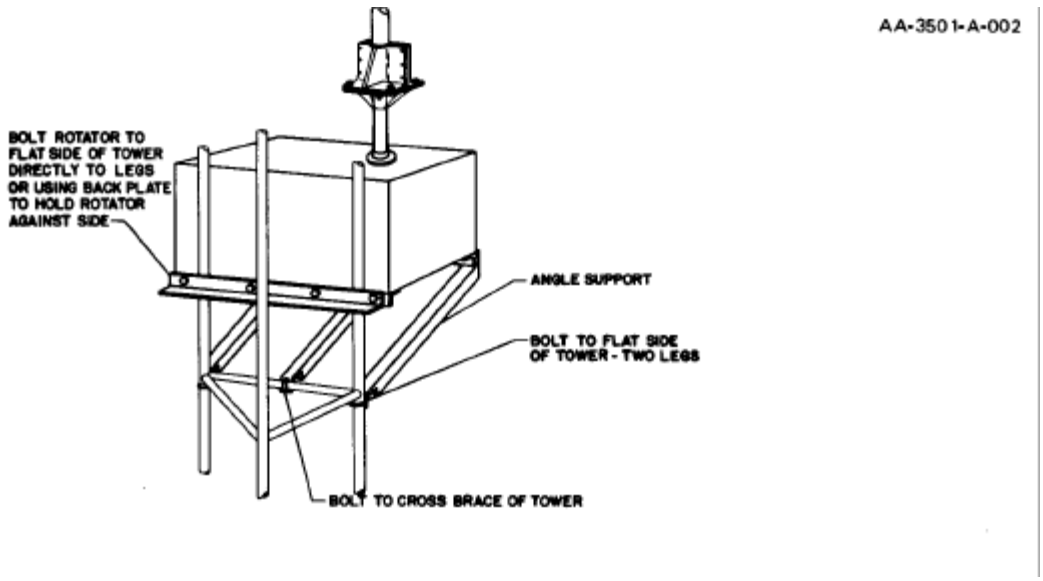
The rotator circuit is wired for 110/120 VAC operation when it is shipped. If it is to operate from a 220/240 VAC source, remove the end plate on the motor and change wiring to conform with the illustration for 220/240 VAC operation. Change the rotator fuse to type FNM-4 cartridge style when using 220/240 VAC



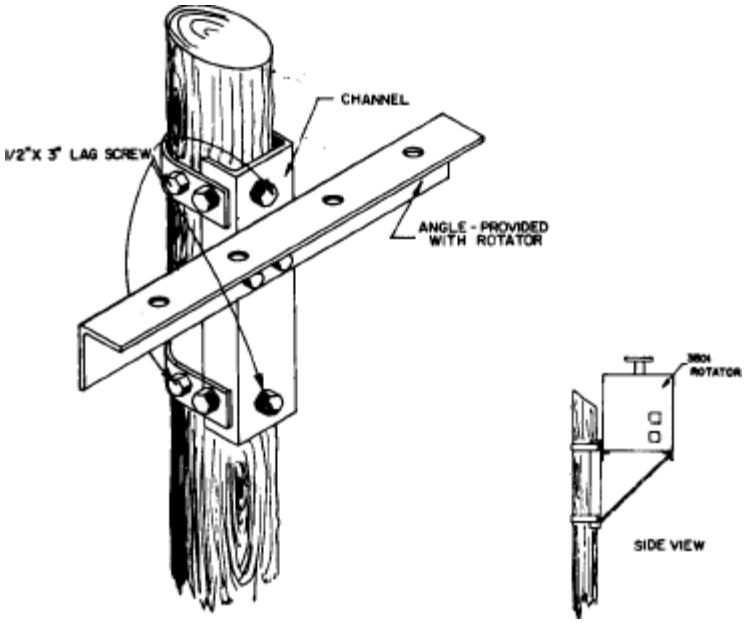
Mounting -

The 3501 BA may be mounted in many ways. Five methods of mounting are described in the following paragraphs:

1. Side of tower mount. Place the side of the rotator against a flat side of the tower and as near to the top as possible. Clamp or bolt the angles to the legs, then attach the rotator to the angles. Support the outer side of the rotator by forming knee braces and bolting steel angles to the outside and attaching the lower end angles to the tower legs. Attach the angles with U-bolts (preferred method) or by bolting (if the legs are large enough where a bolt will not weaken them 1.



2. Side of pole mount. This alternate mounting should only be used under special circumstances. Position the rotator at the top of the pole with the side of the rotator touching the pole. Straps must be attached to the mounting channel and formed around the pole. (Straps and mounting channel are not provided.) The outer side of the rotator is supported by angle braces to the bottom of the channel.



3. Inside of large towers. This may be done in towers which have a crossbracing platforms. The rotator may be seated on one of these platforms. Bolt the shipping hold-down angles to the cross arms of the tower at the appropriate positions and secure them to the rotator with bolts.

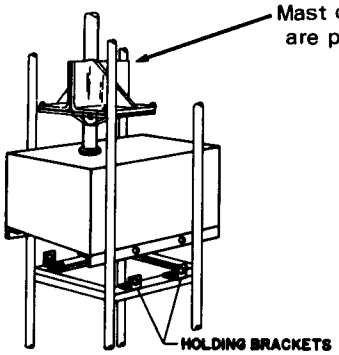
Mounting on Interior of Tower

A. Center rotator on cross brace of tower and mark the position on cross brace where rotator angles touch the cross braces.
B. Drill and bolt holding brackets to the cross braces. C. Bolt angle holding brackets to the rotator angles.

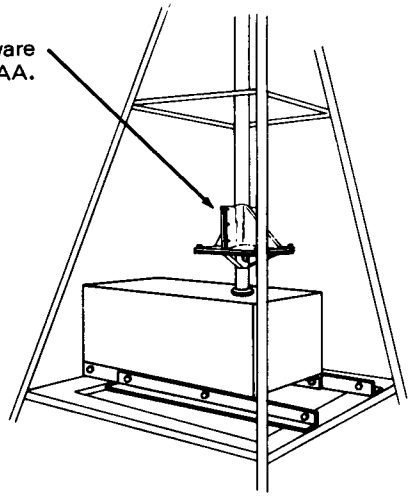
Alternate Method

If inside of tower is too large for rotator, a large plate or additional angle irons must be used to span the distance between cross braces. These angles or plate may then be bolted to rotator angles or holding brackets.

AA-3501-A-004

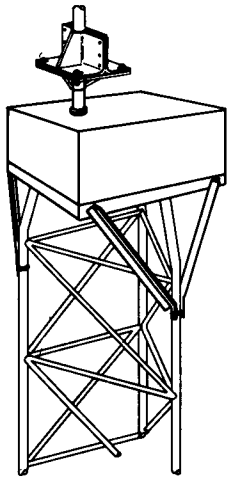


AA-3501-A-005



4. On top of large towers. Where a large, flat-topped tower is available, the rotator may be installed directly on top. This may be secured by bolting directly and securing the four corners with four angles supports to the legs of the tower as shown in the illustration.

AA-3501-A-006

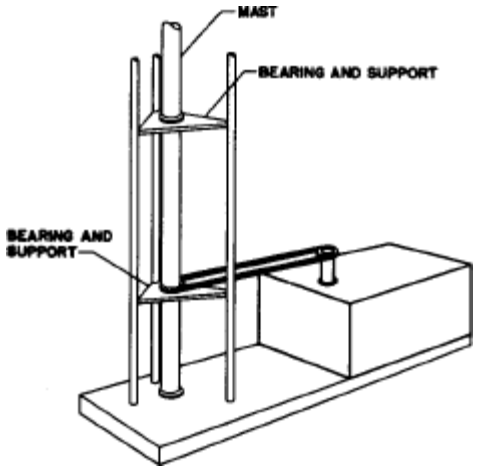


NOTE: Mast clamps and hardware are part of Prod. 3792AA. Product 3792AA contains mast clamps and hardware which are used when mounting the 3501BA to the LP-1007 or antennas other than Hy-Gain models.

The LP-1017CA antenna does not require these clamps; it mounts directly to the rotator output flange. For direct mounting of LP-1017, see "Mast Installation" instructions.

5. Ground mounting. This is desirable where you want the rotating mechanism at ground level while it rotates a long mast on which the antenna is mounted. This may be done two ways. The rotator may be mounted securely to a concrete slab and a small structure built up and around the rotator to secure it to the tower. (Many towers are large enough at the bottom to house this rotator directly.)

AA-3501-A-007



The mast may also be held in a bearing as shown above and the rotator housed outside the tower. The rotator drives the mast by using two sprocket gears and a chain. This requires two identical *#50* sprocket gears and a length of *#50* roller chain.

Mast Installation

The LP-1017 CA antenna is constructed so that the boom-to-mast plate, on the mast assembly, can be mounted directly to the output flange of the rotator. The portion of the mast assembly, below the boom-to-mast plate must be cut off before it can be mounted to the output flange.

Product 3792AA is required for attaching any other antenna to the rotator. It provides a set of mast clamps and hardware to secure the mast of your antenna to the rotator. Center the mast of the antenna on the flange and adjust the clamps so that it will rotate without any eccentricity. This adjustment is important to prevent uneven bearing loads and undue wear.

The maximum allowable bending moment at the top bearing is 2,000 ft-lbs. This is equal to an antenna with a wind load of 500 lbs. at 80 mph placed four feet above the rotator.

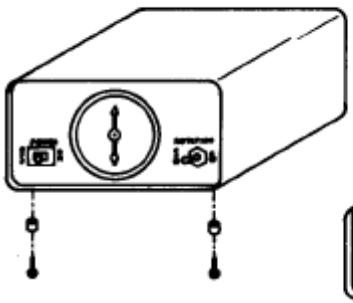
IMPORTANT: Proper installation of the mast clamps requires a torque wrench. Tighten the six 3/8" bolts in the mast clamps to 19 ft-lbs. then tighten the four 1/2" x 2" bolts through the flange to 40 ft-lbs. Tighten the 3/8" bolts securely before tightening the 1/2" bolts, otherwise damage will occur to the clamps. Do not overtighten. The serrations in the clamps are sharp and will bite into the mast securely. The output shaft of the rotator is hollow and the feedline may be passed through it. RF rotary joint assemblies are available from Hy-Gain as optional accessories.

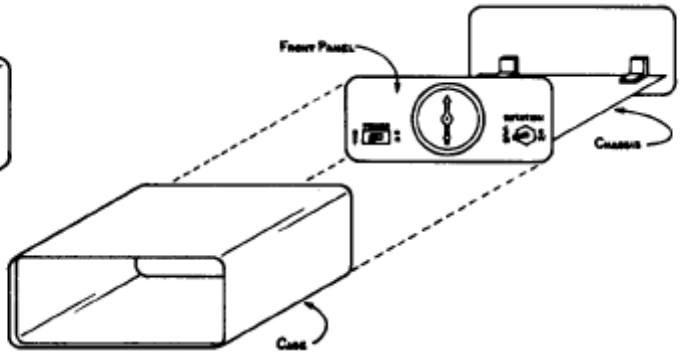
Cable Attachment

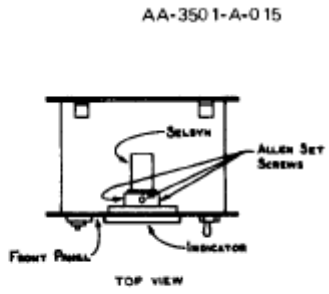
The 3501BA system is furnished with mating cable plugs for the control cable and power input connectors. After installing the rotator and routing the cable, attach the plug, type MS 3106A-18-12S, to the cable following the color code shown on the wiring diagram. Install the power plug MS 3106A-20-23S on the power cable and connect it to the rotator.

Indicator Installation

Place the indicator in the operating position and attach the plug, Jones-type P406CCT, to the cable according to the color code shown on the wiring diagram. Plug the indicator into a 110/120 VAC source. Depress the ON/OFF switch. The indicator lamp should light. The indicator will synchronize with the rotator.







The indicator dial will usually require slight adjustment for accurate readings. Remove the chassis as shown above. Loosen the three Allen screws in the dial frame holding the selsyn and carefully rotate the selsyn in the frame until the dial indicates the proper direction. Tighten the Allen screws and replace the cabinet.

CAUTION

Do *not allow the selsyn to be pulled out of its housing or the arrow pointer will detach from the selsyn shaft.*

Depending on requirements, the limits of rotation may be reset after installation. The limit switches are operated by the pin in the drive gear of the rotator selsyn. To reset limits, loosen the rotator selsyn in its mounting and rotate the drive gear until the limit switches are actuated at the desired heading (preset prior to loosening the selsyn). Re-mesh the gears on the output shaft and selsyn and retighten the selsyn in its mounting. After this adjustment, realign the indicator as described in Indicator Installation.

WARNING

Before climbing the tower and/or performing any maintenance or system adjustments, make certain all power is disconnected from the rotator and indicator. This is a necessary precaution against electrical shock.

Operation

Depress the ON/OFF switch to actuate the CW-CCW switch and rotate the antenna to the desired heading. After severe wind conditions, if the antenna drifts in heading, the indicator will display the new heading after power has been re-applied.

CAUTION

Do not switch directly from CW to CCW or serious damage to the rotator could result. When switching from CW to CCW (or vice-versa), always stop at center off position for at least five seconds.

Parts List

Part No.	Description	Qty
872344	Parts Pack	1
651027	connector MS 3057 12A	1
651597	connector clamp	1
654377	connector 3106 A 20/23S	1
652054	connector 3057 10	2
711028	fuse cartridge	2
711091	plug	1
873501	Rotator Assembly	1
371321	drive clamp base	1
730008	relay	2
270017	selsyn to gear adapter	1
381685	gear	1
381686	threaded trip rod	1

Part No.	Description	Qty
172297	switch bracket	1
740001	selsyn	1
741021	motor painted	1
375900	reducer	1
872335	gear	1
872339	frame	1
882337	shaft with selsyn gear	1
875035	Indicator Assembly	1
701025	ON-OFF switch	1
701099	CW-CCW switch	1
747124	selsyn	1
270019	adapter	1

RETURNING EQUIPMENT FOR SERVICE

Do not ship equipment to the manufacturer without prior authorization. We prefer to send special shipping labels which will avoid the delay of unexpected shipment. If time is extremely important, wire or call for approval and we will rush labels to you. When a shipment is expected, even the time of sending the labels is less than that lost when an unexpected shipment is received.

The shipment must be well packed and fully insured. Damage claims must be settled between you and the carrier, which greatly delays any returns. Proper packing normally avoids this problem.

All shipments must be sent to us prepaid. We do not *accept collect* shipments. All returns should be *made* in our standard cartons. When a shipment is returned, it will be handled in one of three ways:

1. Where all service is in warranty, the shipment will be returned prepaid by a carrier of our choice.

2. If there are any charges not covered by warranty, we will hold the shipment and advise you of costs, which you can then send.

3. Upon your written authorization, we will ship COD for any charges not covered by warranty. The carrier will collect these charges and the transportation costs on arrival. Unclaimed or refused COD shipments will not be reshipped until payment of service and transportation charges are received. Shipment will then be made collect for reshipment transportation charges. Unclaimed equipment automatically becomes the property of Hy-Gain Electronics sixty days after the date of refusal or return and will be disposed of for payment of charges due.

NOTE: We *will not* ship by means of any carrier that will not fully insure the shipment. Some carriers have a $200 limit. The exception to this is when parcel post is the only means of shipment (APO-FPO, etc.). We will ship by this means with your written agreement that you will assume any loss over that which the carrier will insure. COD shipments cannot be made to APO-FPO addresses.

ONE YEAR LIMITED WARRANTY

Hy-Gain Electronics Corporation warrants all products manufactured by it and bearing the Hy-Gain model numbers to be free from defective material and workmanship and agrees to repair such products under normal use and service, if investigation discloses the defect to be the fault of our manufacture. Hy-Gain's obligation under this warranty is limited to repairing any such product which, upon our examination, proves to be so defective. All products repaired under such warranty must be returned to the Hy-Gain factory or any authorized field service station, transportation prepaid by the purchaser, within one year from the date of original purchase from Hy-Gain or authorized Hy-Gain distributor.

This warranty applies only to the original purchaser.

Upon receipt of equipment, the purchaser is responsible for checking the contents for damage. Any shipping damage claims should be referred to the carrier.

This warranty does not apply to any Hy-Gain products which have been repaired, worked upon, or altered by persons not authorized by Hy-Gain to do so, or products to which the repair has injured the stability or reliability of such product, or which has been the subject of mis-use, negligence, or accident, or the serial number of which has been removed, altered, effaced, or in any other way rendered unidentifiable. Neither does this warranty apply to any of our products which have been connected, installed, used, or otherwise adjusted other than in accordance with instruction furnished by Hy-Gain. Nor does Hy-Gain Electronics Corporation assume any liability for consequential damages, and in any event, our liability shall in no case exceed the original purchase price of the product.

Accessories supplied by, but not manufactured by Hy-Gain Electronics shall carry only such warranty as is available from the manufacturer of such goods and are specifically excluded from Hy-Gain warranties.

This warranty is void if Hy-Gain shall inspect equipment and find it to have been modified, improperly installed, or used. This warranty is expressly in lieu of all other warranties expressed or implied, and all other obligations or liabilities on the part of Hy-Gain, and no person including any dealer, agent, distributor, or representative of Hy-Gain is authorized to assume for Hy-Gain any liability on its behalf, or in its name, except to refer purchasers to this warranty.

All claims of defect or shortage should be addressed to:

Warranty Service Department Hy-
Gain Electronics Corporation 4900
Superior Ave. Lincoln, Nebraska
68504

You must furnish model number, date, place, and proof of purchase, such as a copy of the sales receipt, to establish warranty. Your letter should include all pertinent details along with part or item numbers involved. Do not return anything until requested to do so. No warranty card is furnished. You must supply the above information.

Any returned items must have prior authorization. Unexpected returns are greatly delayed in handling. These delays can be avoided by writing in advance and furnishing the necessary information.

DESIGN: Hy-Gain reserves the right to make changes in design and improvements on its products without assuming any obligation to install the same on any of its products previously manufactured. Further, Hy-Gain reserves the right to ship new and/or improved products which are similar to the form, fit, and the function of products originally ordered.

Typical Manufacturer's Worm and Worm Gear Reducer Oils

NAME OF MANUFACTURER	AMBIENT TEMP. 15°-60°F	POUR POINT	AMBIENT TEMP. 50°-125°F	POUR POINT
AMERICAN OIL COMPANY	Amolite Worm Gear'Comp #4	20°F	Amolite Worm Gear Comp #5	10°F
ARKANSAS FUEL OIL COMPANY	Optimus #6	25°F	.....	
ATLANTIC REFINING COMPANY	Mogul Cyl. Oil	25°F	Bessemer Oil	35°F
CARTER OIL COMPANY	Cylesstic T140	20°F	Cantons LK150	20°F
CATO OIL & GREASE COMPANY	Cyl. Oil B	15°F	Cyl. Oil C	10°F
CITIES SERVICE OIL COMPANY	Optimus #6	25°F	Penn Optimus #5	35°F
CONTINENTAL OIL COMPANY	Inca Cyl. Oil	20°F	Zuni Cyl. Oil	15°F
ESSO STANDARD OIL COMPANY	Cylesso T140	20°F	Cantons LK150	20°F
FISKE BROS. REFINING COMPANY	Lubriplate #:8	20°F	Lubriplate #8	30°F
GULF OIL CORPORATION	Acorn Cyl. Oil "B"	10°F	Senate Cyl. Oil "C"	15°F
HOUGHTON & CO., E.F.	Mod. Worm Gear Oil	15°F	M.E. Worm Gear Oil	15°F
HUMBLE OIL & REFINING COMPANY	Cylesso T140	20°F	Cylesso T160	30°F
KEYSTONE LUBRICATING COMPANY	AG #7	45°F	AG #8C	50°F
NATIONAL REFINING COMPANY	Enarco Dark Cyl. Oil	40°F	Enarco Dark Valve	45°F
NEW YORK-NEW JERSEY LUBRICATING CO.	D#17A Comp	10°F	D#18A Comp	10°F
OHIO OIL COMPANY	598 Worm Gear Comp	15°F	.....	
PENNZOIL COMPANY	Pennzoil Cyl. Oil #12	20°F	Pennzoil Cyl. Oil #2	45°F
PENOLA, INC.	Cylesstic T140	20°F	Cantons LK150	20°F
PHILLIPS PETROLEUM COMPANY	Hector S.6008 Steam Cyl. Oil	25"F	Andes "S" Steam Cyl. Oil	25°F
PURE OIL COMPANY	Red Clipper	25°F	.....	
RICHFIELD OIL CORPORATION	Valve Oil Light	20°F	Steam Cyl, Oil Comp.	35°F
SHELL OIL CORP. (CAL.)	Valvata J78	25°F	Valvata J83	20°F
SHELL OIL CORP. (N.Y.)	Valvata J78	25°F	Valvata J83	20°F
SINCLAIR REFINING COMPANY	Moduc Cyl. Oil Lt.	20°F	Superheat Valve Oil	40°F
SKELLY OIL COMPANY	13536 Spec. Gear Oil	5°F	.....	
STANDARD OIL COMPANY, (CAL.)	Calol Gear Comp 130	10°F	Calol Gear Comp. 150	13°F
STANDARD OIL COMPANY, (IND.)	Standard Worm Gear Oil	35°F	Calumet SH Cyl. Oil	35°F
STANDARD OIL COMPANY, (KENT.)	Cylesso T140	20°F	Cantons LK150	30°F
STANDARD OIL COMPANY, (OHIO)	Sohicyl C150	15°F	Sohicyl 650	30°F
SOCONY MOBILE OIL COMPANY	Mobil Cyl. 600 W	40°F	Mobil Super Cyl. 600W	50°F
SWAN FINCH OIL CORPORATION	Safco Worm Gear Med.	35°F	Safco Worm Gear *Hvy.*	25°F
TEXAS COMPANY	Honor Cylinder Oil	30°F	650T Cyl. Oil	35°F
TIDEWATER ASSOCIATED OIL CO., (N.Y.)	Tycol Atwoter 83	60°F	Tycol Atwater 87	50°F
TIDEWATER ASSOCIATED OIL CO., (CAL.)	Tycol Atwater 83	30°F	Tycol Atwater 90	35°F
UNITED OIL COMPANY	United Gear Oil #7 Comp.	40°F	United Gear Oil #8 Comp.	40°F
VALVOLINE OIL COMPANY	Volvene Dark	35°F	#4431 Gear Oil	40°F
WAVERLY OIL COMPANY	Comp. 600 Stock	60°F	Comp. C600 Flash Stack	35°F
CANADIAN COMPANIES:				
BRITISH AMERICAN OIL COMPANY, LTD.	British #1 Cyl.	30°F	Ideal #1 Cyl.	30°F
CANADIAN OIL COMPANY, LTD.	White Rose Valmor 75K	50°F	White Rose Valmor 80K	50°F
CITIES SERVICE, LTD.	Optimus #6	25°F	Penn Optimus #5	35°F
HOUGHTON, CANADA, LTD.	Mod. Worm Gear Oil	15°F	M.E. Worm Gear Oil	15°F
IMPERIAL OIL, LTD.	.....		Cylesso X185	35°F
McCOLL FRONTENAC, LTD.	Regal K	10°F	Texaco 650T Cyl. Oil	35°F
SHELL OIL COMPANY CANADA, LTD.	Valvata J78	25°F	Valvata J83	20°F
TIDEWATER ASSOCIATED OIL CO., CANADA, LTD.	Tycol Atwater 83	60°F	Tycol Atwater 87	50°F