



60" - 72"
MAIN LINE METERS

MODELS
ML20, ML22, ML24, ML11

OPERATION AND MAINTENANCE MANUAL
PARTS LIST

FEATURING:

- *MODEL CN06-2 INDICATOR-TOTALIZER
- * STAINLESS STEEL BALL BEARING PROPELLER



3255 WEST STETSON AVENUE
HEMET, CALIFORNIA 92545 U.S.A.

PHONE: 951-652-6811
FAX: 951-652-3078
VISIT OUR WEBSITE: www.mccrometer.com

WARRANTY

This Warranty shall apply to and be limited to the original purchaser consumer of any McCrometer product. Meters or instruments defective because of faulty material or workmanship will be repaired or replaced, at the option of McCrometer, free of charge, FOB the factory in Hemet, California, within a period of one (1) year from the date of delivery.

Repairs or modifications by others than McCrometer or their authorized representatives shall render this Warranty null and void in the event that factory examination reveals that such repair or modification was detrimental to the meter or instrument. Any deviations from the factory calibration require notification in writing to McCrometer of such recalibrations or this Warranty shall be voided.

In case of a claim under this Warranty, the claimant is instructed to contact McCrometer, 3255 W. Stetson Ave., Hemet, California 92545, and to provide an identification or description of the meter or instrument, the date of delivery, and the nature of the problem.

The Warranty provided above is the only Warranty made by McCrometer with respect to its products or any parts thereof and is made expressly in lieu of any other warranties, by course of dealing, usages of trade or otherwise, expressed or implied, including but not limited to any implied warranties of fitness for any particular purpose or of merchantability under the uniform commercial code. It is agreed this Warranty is in lieu of and buyer hereby waives all other warranties, guarantees or liabilities arising by law or otherwise. Seller shall not incur any other obligations or liabilities or be liable to buyer, or any customer of buyer for any anticipated or lost profits, incidental or consequential damages, or any other losses or expenses incurred by reason of the purchase, installation, repair, use or misuse by buyer or third parties of its products (including any parts repaired or replaced); and seller does not authorize any person to assume for seller any other liability in connection with the products or parts thereof. This Warranty cannot be extended, altered or varied except by a written instrument signed by seller and buyer.

This Warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

McCrometer reserves the right to make improvements and repairs on product components which are beyond the Warranty period at the manufacturer's option and expense, without obligation to renew the expired Warranty on the components or on the entire unit. Due to the rapid advancement of meter design technology, McCrometer reserves the right to make improvements in design and material without prior notice to the trade.

All sales and all agreements in relation to sales shall be deemed made at the manufacturer's place of business in Hemet, California and any dispute arising from any sale or agreement shall be interpreted under the laws of the State of California.

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MAIN LINE METER INSTALLATION

- I. UNCRATING.** When uncrating the meter, any damage due to rough or improper handling should be reported to the transportation firm and McCrometer. If, for any reason, it is determined that the unit or parts of the unit should be returned to the factory, please contact McCrometer for clearance prior to shipment. Each unit must be properly crated to prevent any further damage. The factory assumes no responsibility for equipment damage in return shipment due to improper packaging. The shipping crate contains the following items:

Main Line Meter Assembly with	
CN06-2	1
Mounting Equipment as required	-
Operation and Maintenance Manual	1

- II. INSTALLATION** of McCrometer Main Line Welding Saddle is made to an existing pipeline. The meter must have a full flow of liquid for proper accuracy. The meter installation can be accomplished as follows:

1. WELDING SADDLE METERS can be installed on an existing pipeline by cutting a hole of proper size and welding a meter saddle (furnished with the meter) to the pipe. The installation steps outlined below should be followed carefully to achieve proper mounting of the meter:

A. ALIGN the cutout template in the desired position for the meter on the pipe. Make certain that the center line of the pipe and the center line marked on the template are parallel with each other. Some people prefer to use the saddle as the template.

B. SCRIBE the pipe along the line specified for your meter size cutout.

C. CUT OUT the section of pipe within the scribed line and remove all burrs, slag, and rough edges from the inside and outside of the cutout section.

D. STRAIGHTENING VANES are recommended when there are less than ten pipe diameters of straight pipe (no fittings or obstructions) directly upstream from the meter location. Straightening vanes are available from the factory and, when required, should be installed in the following manner prior to welding the saddle to the pipe:

a.) **HOLD** the vanes on the outside of the pipe ten (10) inches upstream from the center of the cutout opening. The vanes must be parallel to the center line of the pipe and should be equally spaced radially 120 degrees apart.

b.) **MARK** the pipe around the straightening vane bolts and burn or drill holes in the pipe where marked.

c.) **INSERT** the vanes into the pipe through the saddle cutout opening with the bolts protruding through the holes. Place seal (stainless steel with rubber) washers over each bolt, directly against the pipe. Brass washer should be placed between the washer and the nut. Secure nuts to hold vanes to the pipe. Nuts, bolts and washers not supplied. The vanes can be welded to the pipe if desired. **Note:** Meter head assembly (#13) should be removed before welding. (See step IV.)

E. **WELDING SADDLE** should be centered over the cutout section of the pipe. Make certain that no part of the pipe protrudes past the inside edge of the welding saddle. Tack weld the saddle to the pipe prior to welding a continuous bead around the saddle. **Note:** Meter head assembly (#13) should be removed before welding. (See step IV.)

F. **METER ASSEMBLY** should be placed in the line with the propeller nose facing the upstream flow in the pipe. Use care when installing the meter not to damage the propeller as it passes through the saddle opening. The meter head gasket should be inspected for any sign of damage and replaced, if necessary, before installing the meter. Tighten the meter head bolts securely.

MAIN LINE METER OPERATION AND MAINTENANCE MANUAL

III. **MCCROMETER** products have been carefully designed to be as maintenance free as possible. Periodic preventive maintenance, however, is highly recommended and should be practiced according to schedule to assure continuous accuracy and trouble-free performance of your propeller meters. The maintenance and inspection procedure can also be used as a guide to locating a problem in the unit that may be the cause of abnormal meter operation.

Routine preventative maintenance should be performed on all meters, which includes cleaning and an inspection of the propeller and its bearing. The interval between inspections depends on the water quality and the usage of the meter. The initial inspection should be performed after one to two years of service to determine the period between future inspections. After five to ten years, the complete meter should be inspected to ensure years of dependable service.

IV. **METER HEAD ASSEMBLY (#13)** should be removed from the service line by removing the meter head bolts (#49) and lifting up the rear (downstream) portion of the meter head (#13), carefully pulling the assembly back (downstream) and up at the same time to allow the propeller (#38) to clear the inside of the meter saddle and be lifted free. Inspect the meter head gasket (#48) for any sign of damage and replace if necessary. Replace the meter assembly (#13) with a dummy cover plate if the service line is to remain in operation.

V. **WORKING AREA** chosen for disassembly and reassembly of the internal meter components should be clean to reduce the chance of dust or dirt particles being introduced into the meter mechanism.

VI. **INDICATOR-TOTALIZER** service procedure should include removal, cleaning, and inspection of the unit, noting any excessive wear on the gears and other wear points that may lead to operational problems in the unit.

1. **BONNET MOUNTING SCREWS (#2)** located beneath the indicator-totalizer bonnet lid, should be removed and the entire bonnet (#1) lifted off of the meter. Replace the o-ring seals around each of the four screws (#3) and at the bottom of the bonnet (#4) and cover each of the new o-rings with a thin coat of silicone grease.

2. **INDICATOR MOUNTING SCREWS (#6)** and shakeproof washers (#7) holding the indicator-totalizer unit (#5) to the meter head (#13) should be removed and the unit lifted off, exposing the A-drive gear (#11) attached to the top of the vertical shaft (#14).

3. **METER CHANGE GEARS** should be inspected for any sign of wear. The A-(drive) gear (#11) is attached to the top of the vertical shaft (#14), and the B-(driven) gear (#12) is attached to the bottom of the indicator (#5). The position of the A-drive gear should be checked and adjusted if necessary to position the top face of the gear 1/8 inch below the top surface of the meter head (#13). The position of the B-driven gear top face should be 1/8 inch below the bottom of the indicator-totalizer.

4. **INDICATOR-TOTALIZER** unit (#5) should be cleaned thoroughly using a mild soap and a soft brush. Under no circumstances should the entire unit be immersed in the soap or should any metal object be used when cleaning and inspecting the internal parts of the indicator-totalizer unit.

5. **GEARS** within the indicator-totalizer unit (#5) should be inspected carefully. If any excessive wear is visible on the gear teeth and other wear points, the unit must be returned to McCrometer for repair.

VII. **GEARBOX (#21)** on McCrometer meters is sealed and filled with gearbox oil to assure the long life and proper operation of the parts contained in the miter gear frame assembly (#24). Before disassembling the lower meter assembly, however, the oil must be emptied out of the gearbox (#21). Place the meter in a position with the propeller facing downward, to position the oil fill bolt (#22) upward. The screw should be removed and the meter tilted backward in order to empty the oil from the gearbox into a container. Replace the o-ring (#23) around the oil fill bolt and cover the new o-ring (#23) with a thin coat of silicone grease.

VIII. VERTICAL SHAFT ASSEMBLY (#14) is pulled directly out the top of the meter after removing two screws (#16) inside the meter head (#13). Spin the upper bearing assembly (#15) gently, checking for any sign of wear. Inspect the vertical shaft assembly (#14) to be sure it is not bent or damaged.

IX. PROPELLER ASSEMBLY (#38) inspection and cleaning should include a check on the condition of the outside area of the separator (#34), ball bearings (#40 & #45), magnet (#42), and spindle (#35), as well as a thorough cleaning of the propeller (#38).

1. PROPELLER REMOVAL can be accomplished by removing the nose piece (#47).

WARNING: This is a left hand thread, so it must be unscrewed by turning it clockwise with a large adjustable wrench. Now the propeller lock nut (#46) can be removed with a 3/4" socket (standard right hand thread). The propeller (#38) should now be pulled off the support spindle (#35).

2. REMOVING STAINLESS STEEL BALL BEARINGS (#40 & #45) should be done after the first year of operation to determine how they have performed in the particular water in which they are used. If inspection shows excellent condition then the time between inspection, cleaning, and repacking can be extended. The front bearings (#45) should be removed first by inserting the small end of the bearing extractor tool through the rear of the propeller and lightly pushing the bearings out. Now remove the six retainer screws (#44) that hold the drive magnet retaining cup (#43) to the propeller (#39). After removing the retaining cup (#43), slide the drive magnet (#42) and magnet spacer (#41) out the rear of the propeller (#39); now you can remove the two rear bearings (#40). Now the drive magnet retaining cup (#43), drive magnet (#42), drive magnet spacer (#41), and propeller (#39) should be cleaned with warm soapy water to remove any dirt and grease. Any nicks should be sanded off propeller blades.

3. CLEANING BALL BEARINGS (#40 & #45). First remove the bearing seals by inserting a small screwdriver between the inner race and seal and prying upward. After removing seals, if the bearings seem to still have a right radial fit, they should be washed with clear solvent, dried, and lightly repacked with waterproof grease. Seals should now be reinstalled.

4. BEARING INSTALLATION can be accomplished by following these steps: **a)** Reinsert rear bearings (#40) into back of propeller. Be sure bearings are seated properly. **b)** Now insert drive magnet spacer (#41) and drive magnet (#42). **c)** Drive magnet retaining cup (#43) should now be mounted on the rear of the propeller. **d)** Front bearings (#45) should be inserted into front of propeller. Be sure bearings are seated properly.

X. SEPARATOR (#33) AND SUPPORT SPINDLE (#35) are bolted onto the meter gearbox (#21). Remove separator (#34) and miter gear frame (#24) assembly and removing the six mounting bolts (#36) that thread into the gearbox (#21). Rotate separator (#34) gently while pulling from the gearbox (#21). Separator o-ring (#37) should be inspected for any damage and covered with a thin coat of silicone grease.

XI. MITER GEAR FRAME ASSEMBLY (#24) can be removed from separator (#34) by removing four screws from the gearbox (#21) that hold the miter gear frame (#24) to the separator (#34). Spin the driven magnet (#27) to make sure the unit runs freely and inspect the teeth on both the drive (#28) and the driven (#29) miter gear assemblies for any sign of excessive wear. If the assembly spins freely and the miter gears (#28 & #29) are not worn, there should be no further inspection or disassembly of the unit. Should this service procedure show that the unit does not spin freely or that the miter gears are worn, the miter gear frame assembly (#24) should be disassembled as the following steps indicate and all worn or damaged parts replaced.

1. DRIVEN MITER GEAR ASSEMBLY (#29) can be removed by loosening the allen head set screw, located on the side of the gear hub, and pushing the driven miter gear shaft (#34) out of the assembly. Note the location of the shim washer (#30), if any, to be sure it is repositioned properly when reassembling the miter gear frame assembly (#24). When reassembling, be sure the set screws go into recess in the miter gear shafts (#27 & #31), or damage could result. Be sure clevis end of the driven miter gear shaft (#34) is at the same end as the miter gear is located or the meter will subtract from the totalizer.

2. DRIVE MITER GEAR ASSEMBLY (#28) can be removed by loosening the allen head set screw, located on the side of the gear hub, and pulling the driven magnet and shaft assembly (#27) out the front of the miter gear frame (#25). Note any shim washer (#30) that may be positioned behind the drive miter gear (#28) when removing the shaft (#27).

3. COMPONENTS of the miter gear frame (#25) as well as the gearbox (#21) should be completely inspected at this point of disassembly. Each part of the miter gear frame assembly (#24) should be carefully inspected to determine the origin of any operational problem and those parts that are damaged or worn should be replaced. Clean the parts of the unit and reassemble reversing steps (1) and (2) above.

XII. INSPECTION of all internal meter parts that may be replaced in the field has been accomplished at this point. Should any of the meter parts upon inspection, appear to be damaged or excessively worn, they must be replaced to assure proper meter operation and prevent further damage.

XIII. REASSEMBLY is necessary at this point. Before reassembling any parts, make certain that each is cleaned of any dust or dirt and properly lubricated. Cost for replacement parts not covered by warranty are available from current parts and price list. If it is determined that the meter should be returned for repair, please notify McCrometer prior to shipment. Each meter must be properly packaged to prevent damage to the meter in shipment.

1. MITER GEAR FRAME ASSEMBLY (#24) can be put back on separator (#34) with four mounting screws (#32). Make certain that the assembly is installed in a position such that the drive clevis portion of the driven miter gear shaft (#31) can accept the driven clevis portion of the vertical shaft assembly (#14). Secure with four mounting screws (#32).

2. SEPARATOR (#33) AND MITER GEAR FRAME (#24) can now be replaced in the gearbox (#21) with a firm push gently rotating assembly while inserting. Replace the separator o-ring (#37) and cover the new o-ring (#37) with a thin coat of silicone grease. Secure separator assembly (#33) to gearbox (#21) with six mounting screws (#36).

3. PROPELLER INSTALLATION is accomplished by following these steps: **a)** Slide the propeller assembly (#38) onto the support spindle (#35) until threaded portion of spindle protrudes through front bearings (#45). **Note:** Be careful not to let spindle push front bearings out of the propeller. **b)** Thread 1/2" stainless steel lock nut (#46) onto spindle (#35) and tighten to 20 pounds, then thread nose piece (#47) into propeller and tighten snugly.

WARNING: This is a left hand thread. When replacing the propeller (#38), the bearings (#40 & #45) can be checked for excessive radial play by rocking the propeller (#38) gently side to side on its spindle (#35) and separator (#33). Some play is required for proper operation of the ball bearings.

4. GEARBOX (#21) must be filled with three ounces of 10 w mineral oil. A small funnel or an oil can with a small nozzle will make filling the gearbox (#21) easier. Pour the oil through the opening in the top of the meter head (#13).

5. VERTICAL SHAFT ASSEMBLY (#14) should be inserted gently into the gearbox (#21) through the opening in the top of the meter head (#13). Rotate the shaft gently until it is engaged in the driven miter gear shaft (#31) of the miter gear frame assembly (#24). Replace and secure two screws (#16) that hold the upper bearing (#15) in place. Do not overtighten the screws (#16) as this could cock the bearing (#15) and bind the vertical shaft (#14). Turn the top of the vertical shaft (#14) to check for any bind or drag. Should any bind or drag be apparent, it can usually be corrected by adjusting the vertical shaft collar and bearing assembly (#15). Loosen the set screw in the side of the assembly (#15) and

slide the shaft (#14) downward until it rests against the driven miter gear shaft (#31), then lift up about 1/64 inch. Tighten set screw.

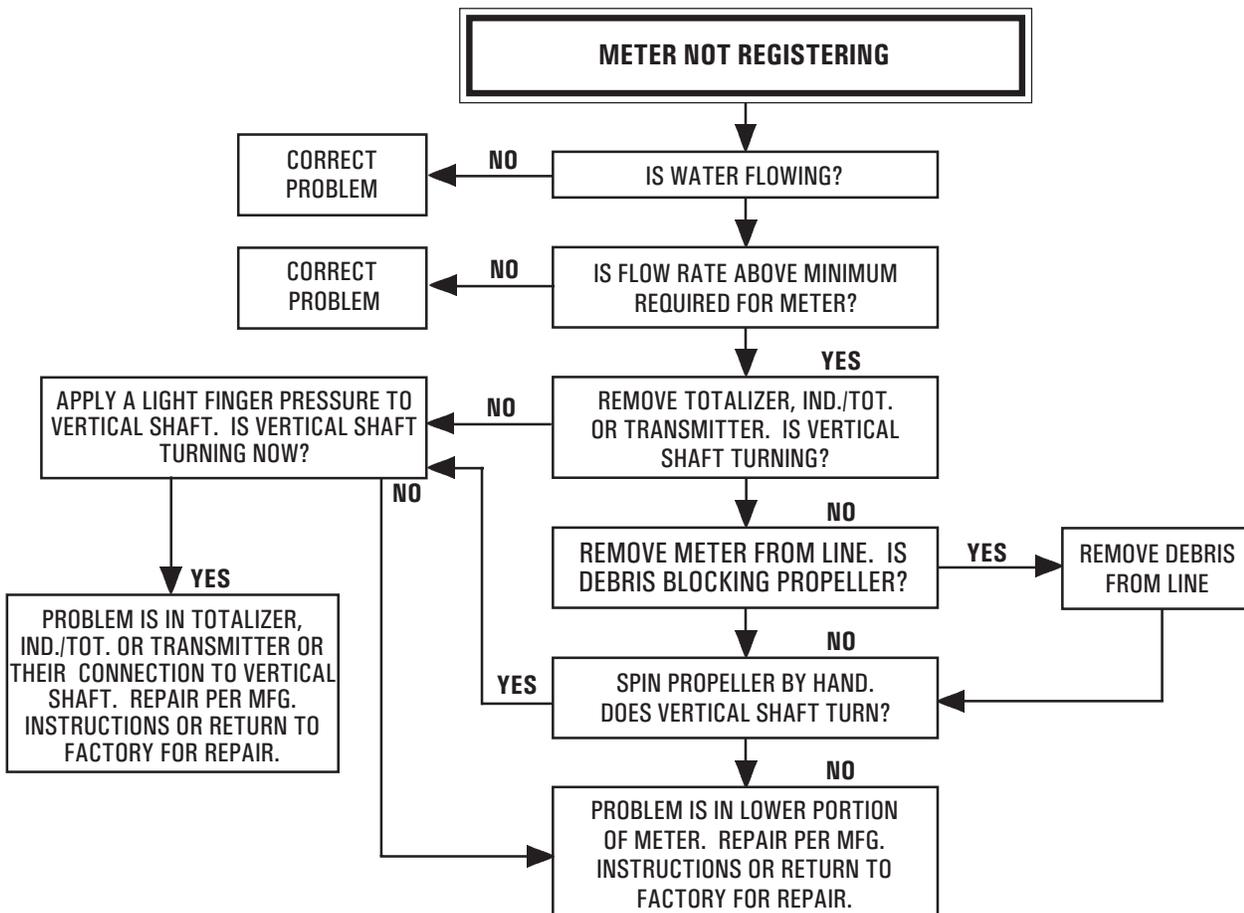
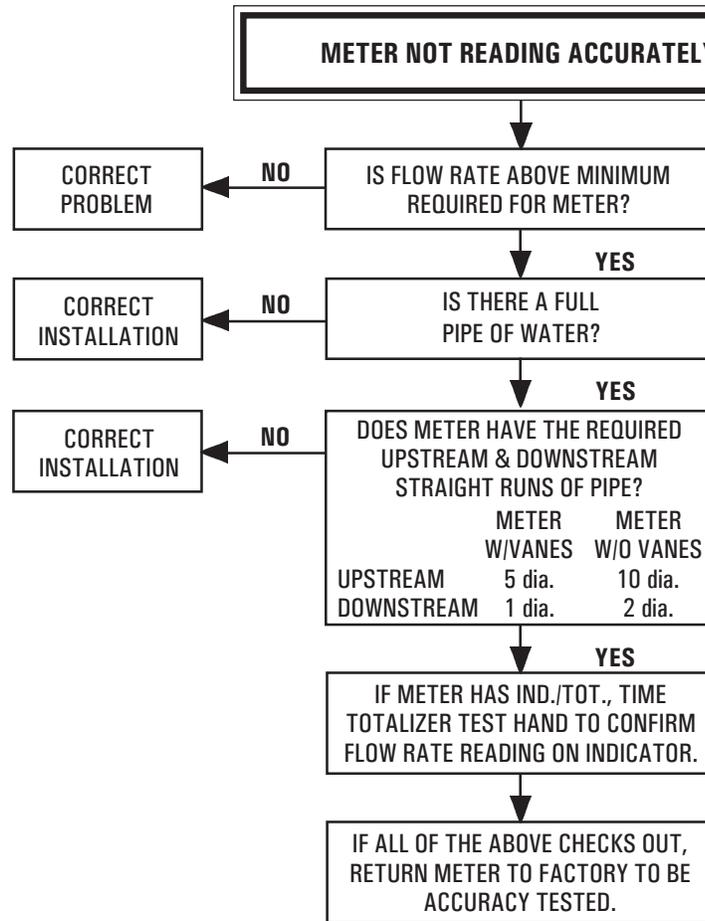
6. CHANGE GEARS (#11 & #12) should be checked again to make certain they are in proper alignment. (See step VI-3.) The gear teeth should be lubricated with a light grease to assure longer life.

7. INDICATOR-TOTALIZER mechanism (#5) should be placed on the meter head (#13) with the mounting screws and shakeproof washers (#6 & #7). The B-driven gear (#12) should be set in the cutout in the meter head (#13). Do not tighten mounting screws (#6) until the gear mesh has been properly adjusted. To adjust gear mesh slide the indicator-totalizer mechanism (#5) towards the A-drive gear (#11) until the unit stops because of full gear mesh. Now back off the indicator-totalizer mechanism 1/64 inch and tighten mounting screws (#6).

8. BONNET ASSEMBLY (#1) should be cleaned and replaced over the indicator-totalizer unit (#5) after replacing the desiccant bag. Secure four screws (#2) beneath the bonnet lid. Do not overtighten the mounting screws (#2) as this will result in damage to the screw o-rings (#3).

9. METER HEAD GASKET (#48) should be inspected for any sign of damage and replaced if necessary. The meter can now be installed in the service line. When replacing the meter on the line, make certain that the top of the welding saddle is smooth and free of any foreign material. Make certain that no foreign materials are attached to the inside of the service line pipe, as any flow disturbance or obstruction may affect the accuracy of the meter.

PROPELLER METER TROUBLESHOOTING FLOW CHART



60"-72" MAIN LINE METERS MODELS ML20, ML22, ML24, ML11 PARTS LIST

NO.	QTY.	PART NUMBER	DESCRIPTION
1	1	7-ML11-*	MAIN LINE METER HEAD ASSEMBLY
	1	5-4337	INDICATOR-TOTALIZER BONNET ASSEMBLY
	1	1-4338	INDICATOR-TOTALIZER BONNET LID (W/PIN)
2	4	1-1115-10-56H	SCREW, BONNET MOUNTING (ea.)
3	4	1-1551-6	O-RING, BONNET MOUNTING SCREW (ea.)
4	1	1-1551-49	O-RING, BONNET
5	1	5-CN06-2	INDICATOR-TOTALIZER MECHANISM (SPECIFY DIAL)
	1	2-4013-‡	DIAL (AS SPECIFIED)
	2	1-1118-3-3	SCREW, DIAL MOUNTING (ea.)
6	1	1-4321	INDICATOR HAND
	1	1-4326	TEST HAND
	2	1-1113-10-6	SCREW, INDICATOR-TOTALIZER MOUNTING (ea.)
7	2	1-1302-10	SHAKEPROOF WASHER, IND-TOT MTG SCREW (ea.)
11A	1	3-2176	A-GEAR ASSEMBLY (5-15 TEETH) (SPEC # OF TEETH)
11B	1	3-2157	A-GEAR ASSEMBLY (16-54 TEETH) (SPEC # OF TEETH)
12	1	3-2163	B-GEAR ASSEMBLY (SPECIFY # OF TEETH)
13	1	3-2101-60	METER HEAD
14	1	3-2461-*	VERTICAL SHAFT ASSEMBLY
15	1	3-2352	VERTICAL SHAFT COLLAR & BEARING ASSEMBLY
16	2	1-1113-6-4	SCREW, VERTICAL SHAFT COLLAR & BEARING MTG. (ea.)
17	1	4-2380-‡	DROP PIPE ASSEMBLY
18	2	1-1551-17	O-RING, DROP PIPE (ea.)
19	16	1-1251-8-20	BOLT, DROP PIPE MOUNTING (ea.)
20	-	1-1806	VIBRA-TITE
21	1	2-2368	GEAR BOX
22	1	1-1251-6-8	BOLT, OIL FILL
23	1	1-1551-21	O-RING, OIL FILL BOLT
24	1	4-2369	MITER GEAR FRAME ASSEMBLY (ITEMS 25 THRU 31)
25	1	2-2369	MITER GEAR FRAME
26	4	1-1504-3	BEARING, MITER GEAR FRAME (ea.)
27	1	3-2371	DRIVEN MAGNET AND SHAFT ASSEMBLY
28	1	2-2372	DRIVE MITER GEAR ASSEMBLY
29	1	3-2374	DRIVEN MITER GEAR ASSEMBLY
30	2	2-2149	SHIM WASHER (ea.)
31	1	2-2375	DRIVEN MITER GEAR SHAFT
32	4	1-1103-8-7	SCREW, MITER GEAR FRAME MOUNTING (ea.)
33	1	3-2366	SEPARATOR ASSEMBLY (ITEMS 34 AND 35)
34	1	2-2366	SEPARATOR
35	1	2-2367	SUPPORT SPINDLE
36	6	1-1103-4-8	SCREW, SEPARATOR MOUNTING (ea.)
37	1	1-1551-18	O-RING, SEPARATOR
38	1	4-2376	PROPELLER ASSEMBLY (ITEMS 39 THRU 47)
39	1	2-2376	PROPELLER
40	2	1-1503-3	REAR BEARING
41	1	2-2378	DRIVE MAGNET SPACER
42	1	1-1601-7	DRIVE MAGNET
43	1	2-2379	DRIVE MAGNET RETAINING CUP
44	6	1-1113-10-6	SCREW, DRIVE MAGNET RETAINING CUP (ea.)
45	2	1-1503-2	FRONT BEARING (ea.)
46	1	1-1210	PROPELLER RETAINING NUT
47	1	2-2377	NOSE PIECE, PROPELLER
48	1	1-1557-24	GASKET, METER HEAD
49	20	1-1253-15-17	BOLT, METER HEAD MOUNTING (ea.)
50	20	1-1301-14-1	WASHER, METER HEAD BOLT (ea.)
51	20	1-1223	NUT, METER HEAD BOLT (ea.)
-	-	1-1804-2	GEARBOX OIL (16 OZ.)
-	1	10015-00K	DESICCANT BAG

When ordering replacement parts, please specify:

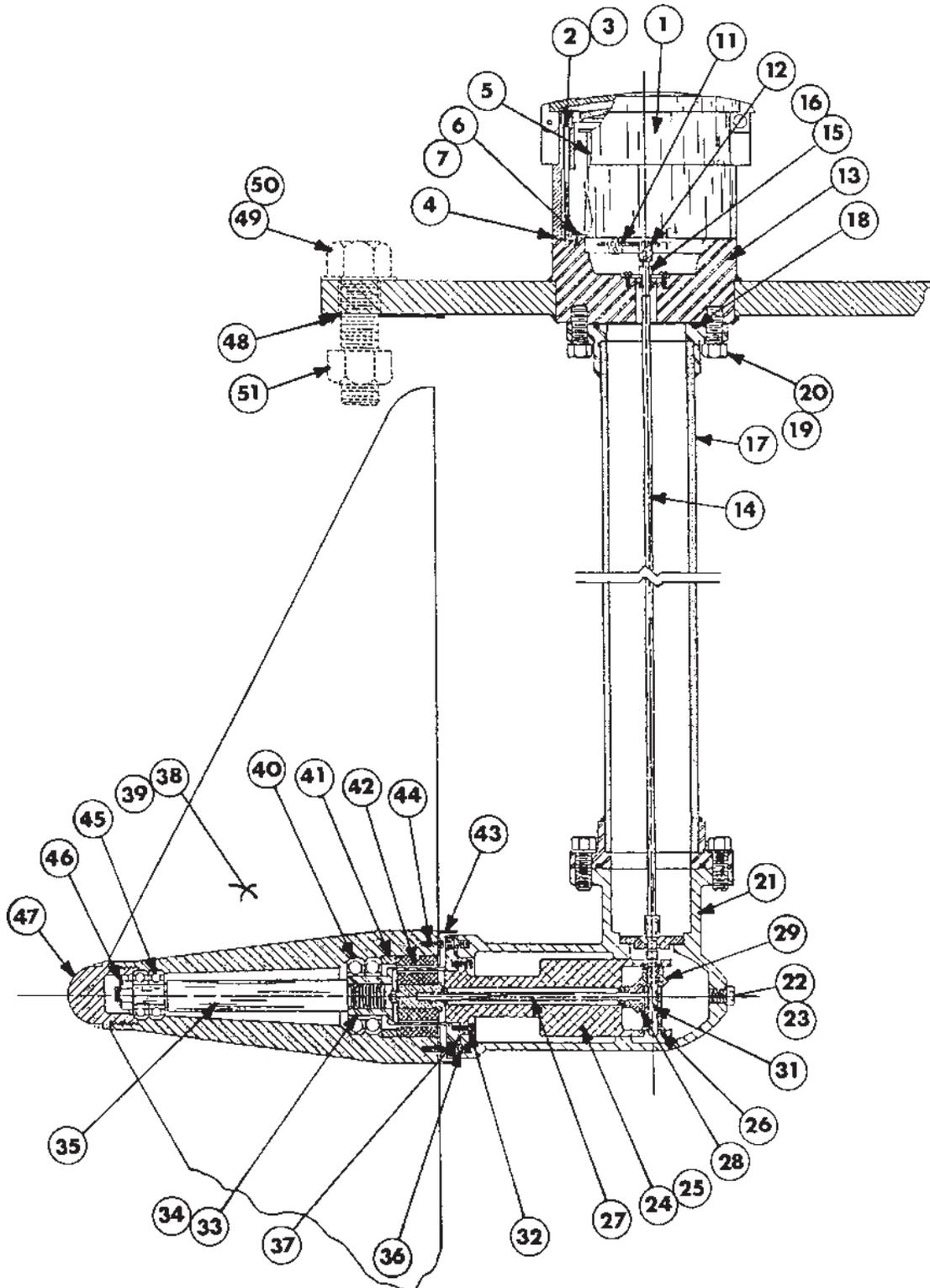
● Meter Size ● Meter Model ● Meter Serial Number

*INSERT METER SIZE TO COMPLETE PART NUMBER

(USE -60 FOR 60"; -66 FOR 66"; -72 FOR 72")

‡CONSULT FACTORY TO COMPLETE PART NUMBER

60"-72" MAIN LINE METERS
MODELS ML20, ML22, ML24, MLI1
 * MODEL CN06-2 INDICATOR-TOTALIZER ASSEMBLY
 * STAINLESS STEEL BALL BEARING PROPELLER



NOTES

WARNING:

BEFORE REMOVING THE METER HEAD FROM THE PIPELINE THE WATER MUST BE TURNED OFF AND PRESSURE MUST BE RELIEVED FROM THE LINE. SERIOUS INJURY CAN RESULT FROM REMOVING A METER HEAD UNDER PRESSURE.

METER SHOULD NOT BE TURNED UPSIDE DOWN AS OIL WILL DRAIN OUT OF THE GEARBOX AND NOT PROVIDE PROPER LUBRICATION TO THE MITER GEARS AND BEARINGS.