



**LL-1 Anchor Locking Kit Operating Manual**  
**Summer 2020**

## DESCRIPTION

The LL-1 Anchor locking kit is designed to be used with Manta Ray anchors that utilize Utility Style SAR-10, SAR-34, or SAR-58 style anchor rods. The LL-1 ASB adapter setting bar is (1"- 8UNC) threaded on each end. One end is compatible with the SAR-10 and SAR-34 anchor rods and the other is compatible with the SAR-58 (11/16-11 UNS) anchor rods. If using other types of anchor rods, please consult with your Manta Ray distributor to ensure compatibility between your anchor rods and the Anchor Locking Kit. Other kits may include different adapter setting bars and/or tapered jaw set depending on the rod size being used.

The LL-1 Anchor Locking Kit (#50127) consists of the following components:

- LL-1FPM 10-ton Jack assembly (#5014)
- LL-1TJ Tapered Jaw Set (#50148)
- LL-1ASB Adapter Setting Bar (#50132)
- Metal Box for LL-1FPM (#50250)
- 5/32 Hex Driver (For adjustment of the Bypass Valve on LL-1FPM) #51188

*Refer to Drawing #E1012-A Page 1 for a pictorial view.*

The Anchor Locking Kit *does not* include a hydraulic power supply or hydraulic hoses. These must be supplied separately. The following power units and hoses are designed to power the LL-1 and are available from your Manta Ray Distributor:

- #50382 GPU18-8 CE 18 HP 8 gpm / 2000 psi portable power unit
- #50255 GPU-2 HP 3 gpm / 2000 psi portable power unit
- #50606 Set of 2 HC-16-25 ½" x 25 ft. Hydraulic hoses with HTMA couplers

The LL-1 Anchor Locking kit is designed to proof test Manta Ray anchors that are installed at angles from 30 degrees to 90 degrees to the Horizontal for normal utility guy line anchors and tiebacks. It is designed to automatically align to the actual installed angle of the Manta Ray anchor. The LL-1 FPM 10-ton jack assembly has a stroke of 8". Most normal operations require 3 – 4 full strokes of the jack to properly lock and test an anchor. The design of the Tapered jaw set and the Adapter setting bar make this operation easy and quick.

## **CONTROLS**

The LL-1FPM 10-ton jack assembly has a manual control valve mounted directly on the body of the jack that allows the operator to control and read the anchor capacity without referencing a conversion chart. The jack is extended (to pull upward on an anchor) by pushing the control valve handle toward the body of the jack. To retract, pull the control valve handle away from the body of the jack. The control valve handle is spring loaded to return automatically to the neutral position. The hydraulic design of the control valve is not designed to hold hydraulic pressure when the valve is in the neutral position. If it is desired to hold a constant load, then the valve handle must be held in the open position for the duration of the load hold.

*See paragraph 7 RECOMMENDED PROOF TEST METHOD.*

## **HYDRAULIC RATING**

HTMA type II

## **HYDRAULIC SAFETY**

The Control valve on the LL-1FPM 10-ton jack assembly contains a simple hydraulic bypass valve that limits the maximum hydraulic pressure to safe levels. This is factory set to 1600 – 1800 psi (at an input flow rate of 8 gpm) which corresponds to 16000 – 18000 pounds of force. This is field adjustable for different anchoring requirements.

*See paragraph 8 ADJUSTING THE BYPASS VALVE.*

Adjustments of this bypass valve are to be done only by a qualified personnel. When used in conjunction with the GPU-2 power unit or alternate power units listed in paragraph 9 OTHER POWER UNITS, the bypass valve must be adjusted.

## SET UP

*Please refer to Drawing #E1012-A*

After the anchor has been driven to the proper depth (including allowance for Load locking pull back) follow these steps to set up the LL-1 Anchor Locking Kit.

1. Thread the LL-1ASB Adapter setting bar onto the anchor rod.
2. Place the LL-1BP Base Plate over the Adapter Setting Bar being careful to use the proper alignment so the small angle iron cross member is closest to the pole that is to be guyed. *See Drawing #E1012-A Page 2*
3. Place the LL-1FPM jack assembly over the Adapter Setting Bar and slide it down until the knife edges on the Jack engage stops on the Base plate.
  - a. For anchors installed at an angle to the horizontal, be sure that the knife edges engage the stops closest to the small cross member.
  - b. For anchors installed vertically (90 degrees to the horizontal), be sure the knife edges are located between the two sets of stops on the base.
4. Place the Tapered jaw set around the Adapter setting bar and securely into the tapered top of the LL-1FPM Jack assembly.
5. Connect the hydraulic hoses between the hydraulic power supply and the LL-1FPM Jack assembly. *See paragraph 11 TRAPPED PRESSURE.*

## OPERATION

***CAUTION:*** *The LL-1 Anchor Locking Kit is capable of pulling with forces up to 20000 pounds. The following precautions must be taken:*

1. Never apply more than 2000 psi to the unit.
2. Use appropriate safety equipment including, but not limited to: steel toe work boots, leather work gloves, hard hats, and safety glasses.
3. Do not stand in line with the adapter setting bar or anchor rod during anchor locking. Stand off to the side.
4. Keep hands, feet, clothing and hydraulic hoses away from the base plate and tapered jaw set during Load Locking.
5. *Always* designate one operator and one helper. The helper and the operator work together to perform the set up, but only the operator performs the actual operation of the LL-1FPM Jack assembly and proof testing the anchor.
6. Be sure to set the bypass valve on the LL-1FPM 10-ton Jack assy to limit the applied load to the desired value. The LL-1FPM 10-ton Jack assy comes from the factory preset to 16000 – 18000 lbs bypass at 8 gpm input flow rate.

After set up is complete, follow these steps to lock and test a Manta Ray anchor:

1. Start the hydraulic power source and activate the hydraulic flow to the LL-1FPM jack assembly. Set the hydraulic power source to achieve a minimum of 2.0 gpm and no more than 8.0 gpm. 4-5 gpm is considered optimum.
2. Check to be certain that all hands, feet, clothing, hydraulic hoses, tools, etc. are away from the base plate before activating the jack. During load locking the base plate will sink into the soil and can trap hands, feet, clothing, etc. *See caution #4 above.*
3. Shift the control valve to the extend position (toward the jack body) to extend the jack. During the stroke of the jack observe the reading on the force gauge. It is common in most soils that the reading will be below 5000 lbs for the first stroke. When the Jack reaches the end, its stroke it will stop automatically by virtue of internal stops. This is called “topping out”. When the jack tops out the load, indication on the gauge will increase rapidly to the bypass setting- this is a false indication. Retract the jack by pulling the valve handle away from the body. The tapered Jaws should release by themselves. If they do not release, tap the side of the tapered top of the jack with a hammer. Fully retract the jack. Lubricate the outside of the Tapered Jaw set and the inside of the tapered top of the jack with any oil or lubricant and reset the tapered jaws. Hydraulic oil works well as a lubricant for the tapered jaws.
4. Repeat step 6-2 as required until either the required load is read on the gauge or the minimum allowable depth of the anchor is achieved.

In some cases, 4 –5 strokes of the load locker will be required to achieve the proper load indication on the gauge. If the load requirement is not met, then a larger size anchor or a greater depth of installation is required.

A formal proof test can be required after locking the anchor. This is usually done by holding a constant load over a period of time and monitoring the deflection of the anchor rod.

*See paragraph 7 RECOMMENDED PROOF TEST METHOD.*

## RECOMMENDED PROOF TEST METHOD

*Please refer to Drawing #E1012-A*

To achieve the best accuracy of Load Locking and Proof testing, set the Bypass Valve on the Jack to the required proof test value prior to Load Locking or proof testing. This allows the operator to fully shift the valve to the extend position while monitoring movement of the anchor without having to worry about controlling the load by “feathering” the control valve. This method of load locking using the LL-1 results in a load accuracy of +/- 10% in the range of 5000 to 20000 lbs. If greater accuracy is required or if the application is critical, then the user should have the LL-1 FPM jack and power source combination calibrated by an independent test Laboratory.

## ADJUSTING THE BYPASS VALVE

**WARNING:** *The bypass valve setting is dependent upon the input flow and pressure. Care should be taken to ensure that the flow and pressure supplied by the hydraulic power unit are the same as those that will be used in service.*

1. Place the jack assembly on the floor, bench or ground without the base plate, tapered jaws or adapter setting bar.
2. Connect the jack to the same hydraulic power source that will be used in service for locking anchors.
3. Start the hydraulic power source and set the throttle at the same position that will be used in service.
4. Extend the jack to the top of its stroke. Keep the control valve shifted fully to the extend position. The bypass valve will now be limiting the hydraulic pressure. You can usually hear a “screeching” sound when the bypass valve is operating. Read the bypass setting directly off the force gauge.
5. If the by-pass setting is not correct, follow steps 6 through 10 to adjust it
6. Relieve the bypass pressure by retracting the jack about 1”.
7. *Refer to Drawing 50141 Sheet 1* for the location of the bypass valve, adjusting the screw on the control valve. Loosen the lock nut using a 13mm or adjustable wrench.
8. Use the 5/32 hex driver provided in the Load Locking Kit to turn the adjusting screw. Thread the adjusting screw in- (clockwise), to increase the bypass setting. Thread the adjusting screw out- (counterclockwise), to reduce the bypass setting. Repeat step 4 to read the new bypass setting.
9. Repeat steps 4-8 until the bypass setting is at the desired level.
10. Tighten the lock nut.

## OTHER POWER UNITS

Any compatible open center hydraulic power supply that supplies 2-8 gpm and up to 2000 psi is acceptable for use with the LL-1. Be sure that the hydraulic flow direction of the power unit matches the in and out labels on the control valve on the LL-1FPM 10 Ton Jack Assy. Reversed flow is a common problem and the jack will not extend or retract when the control valve handle is shifted.

*Caution: LL-1FPM jack assembly is a double acting jack designed to be operated with hydraulic power sources capable of 2000 psi maximum and 2 – 8 gpm. If other power sources are used, then the user does so at their own risk and it is highly recommended that the user consult with a professional hydraulic supplier to determine the combination is safe and that the bypass valve on the LL-1FPM is properly set.*

## TROUBLE SHOOTING

### Symptom, Probable Cause & Remedy

**Cannot connect hydraulic couplers:** Trapped pressure – see paragraph 11  
TRAPPED PRESSURE

**Jack does not extend:** If the hydraulic flow not activated on power source, turn on the flow.

**Hydraulic flow direction backwards:** Check that the pressure port from hydraulic power supply is mated to the port on the LL-1FPM Valve labeled “IN”, and the return (tank) port on the power source is mated to the port on the Valve labeled “OUT”. See Drawing #50141 Sheet 1 of 2 for location of the port labels on the valve.

**Jack does not achieve required load, but anchor is not moving:** Hydraulic flow from power unit is too low. Open throttle on the power source to achieve a higher flow rate. If this does not solve the problem, then readjust the bypass valve. This is a common problem with alternate low flow rate power rate units.

**Gauge reads 4000lb load with valve handle in neutral position, but there is no load on anchor:** This is a characteristic of the hydraulic design of the control valve called trapped back pressure. Back pressure from hydraulic flow is trapped on both sides of the jack piston and registers on the gauge when the valve is shifted into the neutral position. It does not affect the accuracy of the gauge reading if the recommended method of proof testing is followed. The phenomenon manifests itself to a greater degree at higher flow rates like 5- 8 gpm and is very evident when the

jack is extended very quickly under no load. In this situation, the back pressure and the internal friction of the jack add together to produce high gauge readings associated with the rapid movement of the jack. It is virtually nonexistent at lower flow rates like 1-2 gpm. The gauge reading will drop to 0 when the circuit is deactivated, the hydraulic power supply is turned off and the control valve handle is cycled back and forth between the extend and retract positions. Be sure to follow this procedure prior to disconnecting the hydraulic hoses. If the trapped back pressure is not relieved prior to disconnecting the hoses, the hydraulic couplers will be difficult and sometimes impossible to reconnect. If the gauge reading does not drop to zero with everything turned off after cycling the valve, then the gauge is defective and should be replaced.

## TRAPPED PRESSURE

Trapped pressure can cause hydraulic couplers to become difficult and sometimes impossible to connect by hand. This is a normal occurrence with almost all types of hydraulic tools and couplers.

The three most common sources of trapped pressure are:

1. Failure to relieve any trapped back pressure in the tool circuit prior to uncoupling hoses from tools. This is avoided by cycling the tool control valves (on and off, up and down, extend and retract, etc.) several times after turning off the hydraulic flow from the power unit but prior to uncoupling.
2. Sunlight heating hoses, tools, especially dark colored items.
3. Uncoupling the hoses prior to turning off the hydraulic flow from the power unit.

The proper practices when switching hydraulic tools will avoid trapped pressure:

1. Turn hydraulic flow off at power unit.
2. Cycle the tool control valve off and on several times.
3. Disconnect hoses from tool #1.
4. Connect couplers to tool #2.

If trapped pressure does occur, it must be relieved. Here are some suggestions on how:

1. Loosen a fitting very slowly and carefully to allow some fluid to “leak out”. This will relieve the trapped pressure.
  - a. **CAUTION:** Hydraulic fluid can squirt out at very high velocities which can cause injury. Always cover the fitting to be loosened with a rag and always wear appropriate safety equipment especially glasses.
  - b. The best choice is a JIC or Flare fitting because of its ease of loosening and tightening. If an O-ring style fitting is chosen, be sure to properly



reposition the O-ring prior to retightening the fitting or the O-ring will become damaged and a new O-ring will be required.

2. On the LL-1 FPM 10-ton jack, the best choice is the JIC joint between the power input hoses and the control valve. Refer to Drawing 50141
3. Sometimes repeated cycling of the control valve on the LL-1 FPM will reduce the pressure enough to force couplers together.
4. Sometimes repeated attempts to connect a coupler will allow enough fluid to “leak out” that the connection can be made.

## **SPARE PARTS**

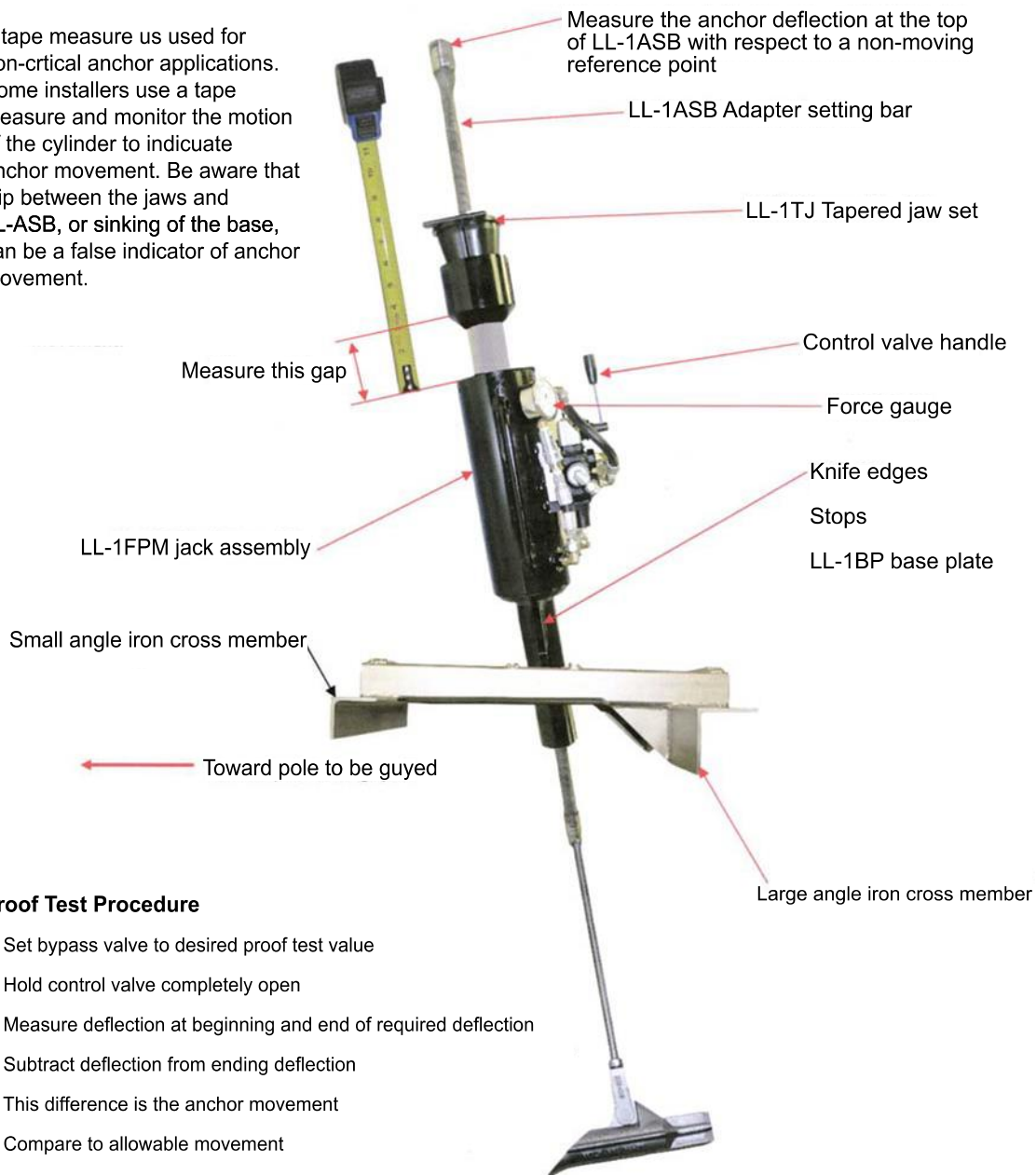
Spare parts for the LL-1 Anchor Locking kit are available from your Manta Ray distributor. Refer to Drawing #E1012 for the major component parts of the LL-1 Anchor Locking Kit. Refer to Drawing 50141 for the plumbing components of the LL-1FPM 10-ton jack assembly.



***Also included in kit:***

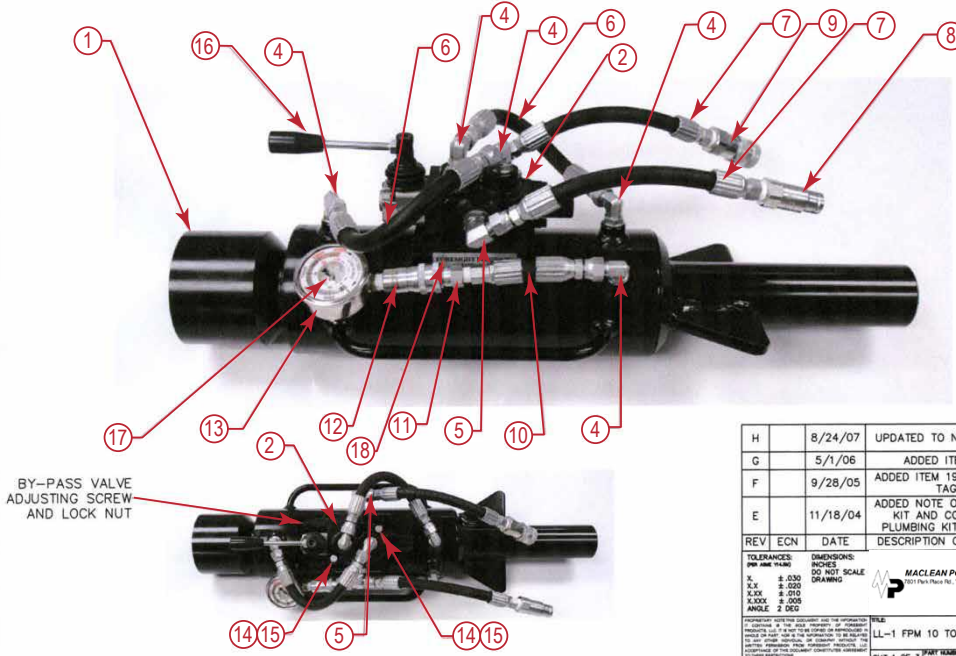
1. Metal container for LL-1FPM P/N: 50250  
(33L(838.2) x 12W(304.8) x 11(279.4))
2. Manual

A tape measure is used for non-critical anchor applications. Some installers use a tape measure and monitor the motion of the cylinder to indicate anchor movement. Be aware that slip between the jaws and LL-ASB, or sinking of the base, can be a false indicator of anchor movement.



**Proof Test Procedure**

1. Set bypass valve to desired proof test value
2. Hold control valve completely open
3. Measure deflection at beginning and end of required deflection
4. Subtract deflection from ending deflection
5. This difference is the anchor movement
6. Compare to allowable movement



H	8/24/07	UPDATED TO NEW DESIGN
G	5/1/06	ADDED ITEM 20
F	9/28/05	ADDED ITEM 19, METAL ID TAG
E	11/18/04	ADDED NOTE ON PUMING KIT AND COMPLETE PLUMBING KIT SHEET 2
REV	ECN	DATE DESCRIPTION OF CHANGE
TOLERANCES PER ANSI Y14.5		DIMENSIONS IN INCHES DO NOT SCALE
X	± .030	DRAWING
X.X	± .003	
X.XX	± .010	
X.XXX	± .005	
ANGLE	2 DEG	
		MACLEAN POWER SYSTEMS 1011 Park Plaza Rd., York, SC 29745 USA
TITLE LL-1 FPM 10 TON JACK ASSY		FILE LL-1 FPM 10 TON JACK ASSY
SHT 1 OF 3		PART NUMBER: 50141

NOTES: UNLESS OTHERWISE SPECIFIED:

- VISUALLY INSPECT ALL HOSES PRIOR TO ASSEMBLY FOR PROPER INSIDE DIAMETER AND OVERALL CONDITION.
- USE TEFLON TAPE ON ALL NPT JOINTS.
- VALVE HANDLE MUST NOT STICK IN EITHER THE RETRACT OR EXTEND POSITIONS.
- PRE-DRILL HOLES FOR RIVETS IN SIDE OF METAL VALVE SUPPORT. RIVET METAL ID TAG.
- ALWAYS WEAR EYE PROTECTION AND OTHER APPROPRIATE SAFETY GEAR WHEN TESTING ANY HYDRAULIC EQUIPMENT.
- ONLY TRAINED, QUALIFIED INDIVIDUALS SHOULD ASSEMBLE AND TEST AN LL-1 FPM. CONSULT SHOP SUPERINTENDENT IF UNSURE.
- ALWAYS LEAVE LL-1 FPM IN COMPLETELY RETRACTED STATE TO AVOID POTENTIAL DAMAGE TO PISTON.
- ALWAYS CYCLE THE VALVE HANDLE AFTER TURNING OFF HYDRAULIC POWER UNIT TO RELIEVE ANY TRAPPED PRESSURE PRIOR TO DISCONNECTING HYDRAULIC COUPLERS.

**LL-1 FPM TESTING NOTES**

- ENSURE THAT ALL FITTINGS AND HOSES ARE PROPERLY TIGHTENED.
- INITIAL PLUMBING AND TESTING MAY BE DONE WITH A SMALL HYDRAULIC POWER UNIT TO FILL AND CHECK FOR LEAKS. WHEN CHECKING FOR LEAKS, POWER THE CYLINDER AT LEAST TWO TIMES TO FULL STROKE IN BOTH EXTENSION AND RETRACTION DIRECTIONS.
- BE SURE THE HYDRAULIC FLOW DIRECTION MATCHES THE ARROWS ON THE HYDRAULIC COUPLERS (A) AND THE IN/OUT LABELS ON THE VALVE (C) PRIOR TO TESTING THE CYLINDER. THE CYLINDER SHOULD TOWARD THE CYLINDER. IT SHOULD RETRACT WHEN TOWARD THE CYLINDER. IT SHOULD RETRACT WHEN THE HANDLE IS PULLED AWAY FROM THE CYLINDER.
- FINAL TESTING SHALBE DONE WITH AN 8 GPM HYDRAULIC POWER UNIT. PLACE A FLOW/PRESSURE TEST GAUGE BETWEEN THE HOSE FROM THE POWER UNIT AND THE INPUT HOSE TO THE VALVE. IF TEST GAUGE IS EQUIPPED WITH A NEEDLE VALVE, MAKE SURE IT IS FULLY OPEN.
- SET POWER UNIT TO PROVIDE 8 GPM. THE TEST GAUGE PRESSURE READING OF THE INACTIVE SYSTEM SHOULD NOT READ ANY HIGHER THAN 500 PSI. IF PRESSURE READS OVER 500 PSI CONSULT A Q/C REPRESENTATIVE.
- EXTEND AND RETRACT THE LL-1 CYLINDER, BY FULLY SHIFTING THE HANDLE AT LEAST 2 FULL CYCLES. EXTEND THE CYLINDER AGAIN AND READ THE TEST GAGE AT THE MID POINT OF THE STROKE WHILE THE CYLINDER IS MOVING. IF THE PRESSURE EXCEEDS 1000 PSI CONSULT WITH A Q/C REPRESENTATIVE.
- PLACE SOB BAR THROUGH JACK WITH PLATES AND NUTS TO STOP JACK AT MID STROKE. CYCLE JACK 0 - 20,000 LBS 3 TIMES. CHECK FOR LEAKS AT PISTON TUBE / STATIONARY TUBE INTERFACE.
- PERFORM LOAD VERIFICATION TEST AND KEEP THE LOAD VERIFICATION SHEET WITH THE UNIT. LOAD VERIFICATION SHEET WITH THE UNIT.
- TO SET THE BY-PASS VALVE, FULLY EXTEND LL-1 CYLINDER. LOOSEN THE LOCKOUT AND ADJUST WITH AN ALLEN WRENCH. ACCEPTABLE SETTING IS 16,000-18,000 LBS. SECURE SETTING BY TIGHTENING LOCKOUT. RETRACT CYLINDER.
- ONCE TESTING IS COMPLETED, FILL OUT THE PROPER PRODUCTION FORM AND RETURN IT TO THE SHOP SUPERINTENDENT OR A Q/C REP.

**MODIFICATIONS FOR #51012 LL-1FPM-MSS (FOR MARINE VERSION)**

- SHORTEN TUBE EXTENSION BY CUTTING TUBE 1" BELOW "NOISE EDGES".
- GRIND BEVEL ON TUBE ID AND OD, REMOVE ALL BURRS PAINT OUT AND GROUND AREA BLACK
- ITEMS 7 and 8 ARE REPLACED WITH ADAPTERS AND STAINLESS STEEL COUPLERS
- IDENTIFY THE ASSY AS #51012 LL-1FPM-MSS

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TITLE: LL-1 FPM 10 TON JACK ASSY  
SHT 3 OF 3 PART NUMBER: 50141 REV: H

50141 BILL OF MATERIAL

ITEM NO	QTY	P/N	DESCRIPTION
1	1	50201	HYD CYL FOR LL-1 (AU0161)
2	1	51185	LL-1 HYD VALVE
3	1	51069	PLUMBING KIT CONSIST OF
	4	50276	MB-MJ90-6
	5	51187	HYD FTG MB-MJ90-8-8
	6	50746	9X3/8-6FJX-6FJX
	7	50162	10X3/8-6FJX-BMP(NO SWIVEL)
	8	50160	FF-372-6FP MALE
	9	50161	FF-371-6FP FEMALE
	10	50748	5X3/8-6FJXC-AMP (NO SWIVEL)
	11	50159	SM-252 MALE
	12	50158	SM-251 FEMALE
	13	50164	0-3000 PSI 2.5-4MP
	14	00041	BOLT 1/4-UNC X 2 GRADFE SUNC
	15	00062	NUT 1/4-20 NYLOCK
	16	51186	LL-1-HYD VALVE HANDLE
	17	50253	GUAGE STICKER FOR LL-1 (LBS/KN)
	18	51095	METAL ID TAG ( ADHERE SIDE OF SUPPORT)
COMMON REPAIR AND SPARE PARTS			
		50254	LL-1 FORCE GAUGE, STICKER AND COUPLER
		50749	SEAL KIT FOR LL-1(AU0161) CYL
	16	51186	LL-1-HYD VALVE HANDLE

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TITLE: LL-1 FPM 10 TON JACK ASSY  
SHT 2 OF 3 PART NUMBER: 50141 REV: H