

INSTALLATION OPERATION & MAINTENANCE MANUAL

MODELS
MSH-30 Group
MSH-60 Group
REMOTE DISPENSERS

V2.03



Pump Measure Control, Inc.
1070 Nine North Drive, Suite 100
Alpharetta, GA 30004

Phone (770) 667-0667
Fax (770) 667-0476

www.pmc-ga.com



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READ THIS FIRST

Equipment Inspection

When the dispenser(s) arrive at the installation site, unpack the units and inspect for possible shipping damage. Make all claims concerning damage to the freight carrier. Pump Measure Control (PMC) as shipper, is not liable for the hazards of transportation.

After unpacking and prior to installation, inspect all equipment to verify all required materials are on hand, and the dispensers have all the ordered options and markings. Compare the model number on the dispenser model / serial plate to the model number notation information in section 1 of this manual. If discrepancies in dispenser options and markings are determined, contact Pump Measure Control at (770) 667-0667.

Read all instructions and tags carefully prior to performing any work on the dispenser. An improperly installed or maintained dispenser can be dangerous and will likely be a source of ongoing problems.

1- IMPORTANT SAFETY INFORMATION

INSTRUCTIONS PERTAINING TO A RISK OF FIRE, ELECTRIC SHOCK, OR INJURY

The following procedures are mandatory and shall be followed when installing, maintaining, operating or servicing this equipment. Fire, explosion and electrical shock can occur and result in death or serious injury if the safe service practices outlined in this manual are not followed. The hazards and safety precautions associated with installing, maintaining or servicing the dispenser are detailed in the corresponding sections of this manual. Read all safety information and applicable sections in this manual before performing any work. Only trained or authorized individuals should install, inspect, maintain or service this equipment.

Emergency Shut-Off

Before performing any work at a location, identify the switch or circuit breakers that disconnects power to all fueling equipment, dispensing devices, and submerged turbine pumps (STPs).



Explosive / Flammable Environment

The fuel and associated vapors present in and around a dispenser are very flammable. In addition, the vapors can become explosive in the right concentrations. Clean up all spilled or leaking fuel immediately using an absorbent. Dispose of all contaminated material as required by regulatory agencies.



If the work being performed requires access to the dispenser's lower cabinet, allow it to 'air out' by opening it up before you begin. Open flames and sparks can ignite any fuel or vapors that may be present and therefore must be prevented. Never permit smoking or use of lighters and / or matches in the dispensing area. Other sources of ignition include welding torches and sparks generated by various sources including power tools, automobile starters and static electricity.

Read the Manual

Safety is of utmost importance! It is imperative that you understand the procedures necessary to complete a task before beginning any work. Read, understand and follow this manual and all applicable materials / labeling supplied with this dispenser. If you have questions or do not understand a procedure, call PMC - Tech Support at 770-667-0667.

Codes and Regulations

This equipment must be installed, operated and maintained in accordance with all federal, state and local codes and regulations. This includes, but is not limited to NFPA 30 *Flammable and Combustible Liquids Code*, NFPA 30A *Code for Motor Fuel Dispensing Facilities and Repair Garages*, NFPA 70 *The (NEC) National Electric Code*. Failure to do so may lead to violations and/or prevent safe operation of the equipment.

Replacement Parts

Use only genuine PMC repair parts and retrofit kits when making repairs or servicing this dispenser. Using non-PMC replacement parts may create a safety hazard and violate local regulations.



Safety Symbols and Signal Words

This safety alert triangle is used throughout this manual to alert you to a precaution or procedure that must be followed to avoid potential safety hazards.

The signal words DANGER, WARNING and CAUTION are used in this manual and on warning labels to alert you to the seriousness of the hazard. All safety procedures following these signal words must be followed to prevent serious injury or death.



DANGER - indicates a hazard or unsafe practice that **will** result in death or serious injury.



WARNING - indicates a hazard or unsafe practice that **may** result in death or serious injury.

CAUTION - indicates a hazard or unsafe practice that may result in minor injury or equipment damage.



Electrical Safety

Use safe and established practices in working with electrical devices. Be sure grounding connections are properly made.

Refer to GROUND in Section 3 of this manual for specific information. Failure to do so may result in injury, damaged equipment or improper/erratic operation. All conduit sealing devices and compounds must be in place. Follow all OSHA Lock-Out and Tag-Out requirements / procedures. Make sure all station employees and service contractors on site understand these procedures to ensure safety while the equipment is being serviced or repaired.

SAVE THESE INSTRUCTIONS IN A READILY ACCESSIBLE AREA

2 - INTRODUCTION

Scope

This manual contains the information necessary to install, operate, service and maintain the PMC **MSH** Group of dispensers. Please read, understand, and follow this manual and all applicable CODES and NFPA requirements before installing the equipment. Improper installations are a major source of dispenser failures and ongoing problems. The equipment must be installed and operated as directed by this manual to ensure proper and reliable operation.

Failure to install the dispenser per PMC specifications may void the warranty. All procedures described should only be performed by trained / authorized personnel.

WARNING	
<p>Per UL87A requirements, dispensers must not be changed from its original application by changing fuel types once installed. For instance, if installed for a gasoline/ethanol blend such as E25 or E85, the dispenser can not be changed to traditional gasoline at a later date.</p>	
<p>Leaks and potential environmental hazards can result or components may fail prematurely.</p>	
<p>To avoid these issues, follow the instructions in this manual and do not change fuel types once installed.</p>	

Description

Shipping Weight:	approx. 185 lbs
Power Requirement:	
AC Power Supply (standard):	120VAC / 60Hz, 1Ø
DPDT Switch Rating:	
AC (standard):	20A / 1HP @ 125VAC 20A / 2HP @ 250VAC
Operating Environment:	
Ambient Temperature:	-30°C ≤ Ta ≤ +60°C
Relative Humidity (non-condensing):	0% to 95%

The **MSH** Group of remote dispensers are available in standard (up to 30GPM) or high speed (up to 60GPM) flow rates.

Standard Features:

- Dimensions: 28"W x 18"D x 48"H
- Powder coated, heavy gauge steel frame
- Single product / single hose configuration
- Meter: Liquid Controls M-5 positive displacement (up to 60 GPM)
- Registration: U.S. GALLONS: 0 - 9999.9
- Non-resettable totalizer: 0 - 9999999.9 Gallons
- Solenoid Valve: Standard: 1"
High Flow: 1-1/2"
- Satellite feed on specific models
- Lane Oriented nozzle boot
- Hard wire interface (looks like mechanical dispenser to controller)
- 120VAC / 60Hz / 1Ø operation

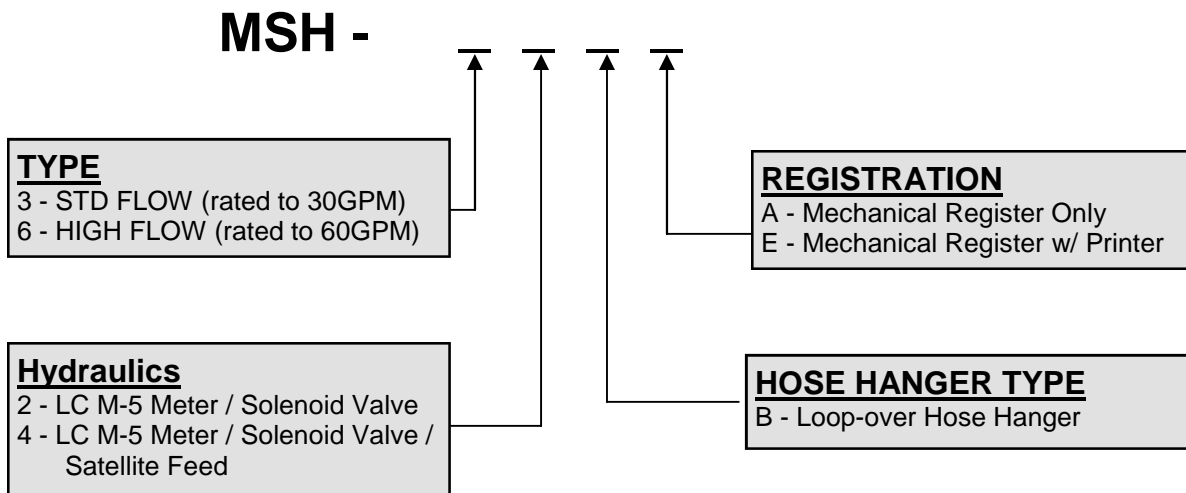
Options:

- All stainless steel construction
- Veeder-Root Pulser (volumetric)
- Inlet filter
- COMMERCIAL (volume only) Displays
- Liters or Imperial Gallons Registration
- 240VAC / 50Hz / 1Ø operation

Model Codes

The serial plate on the **MSH** dispenser is located on the left side of the pedestal, when viewed from the front. The plate contains both the model number and serial number identifying the dispenser.



MSH MODEL NUMBERING SCHEME





3 - INSTALLATION INSTRUCTIONS

This section provides information for proper installation and wiring of your MSH dispenser and related equipment. It is essential that you understand the requirements of the system before attempting the installation. You should be familiar with, and have available for reference, the appropriate manuals for all other equipment to be installed and connected with the dispenser.

General Requirements

	WARNING	
<p>Gasoline blends containing 15% or more ethanol may not be compatible with certain materials and hydraulic components. Leaks or component failure may result, causing fire or explosion or environmental damage.</p> <p>When dispensing gasoline blends containing 15% or more ethanol, consult the manufacturer of all fuel system components to verify compatibility with the fuel being dispensed. This includes the fuel dispenser itself.</p>		

	WARNING	
<p>The installation must conform with all applicable Federal, State and Local building / fire code requirements. This includes, but not limited to, NFPA (National Fire Protection Agency) 30 <u>Flammable and Combustible Liquids Code</u> , NFPA 30A <u>Code for Motor Fuel Dispensing Facilities and Repair Garages</u> and NFPA 70 <u>National Electrical Code®</u>. Failure to adhere to these requirements could result in severe injury or death.</p>		

	WARNING	
<p>Gasoline and petroleum products that may be present during the installation of a dispenser are flammable and explosive, creating a dangerous environment requiring safe practices to prevent or avoid serious injury or death. Read and understand all sections of this manual prior to beginning an installation. Follow all instructions and heed all DANGER, WARNING and CAUTION blocks .</p>		

- Read and understand the entire Safety Information section located at the front of this manual.
- The complete instructions for other equipment used in the installation of the dispensers, such as STPs, shear valves, etc., must be provided by the manufacturer of that equipment.
- Plan the installation carefully and follow instructions. Many dispenser problems are caused by faulty installations.
- The dispenser installation MUST be done by a qualified installer / electrician.

Survey Site Prior to Installation

Prior to beginning installation of the dispenser, survey the site and verify that

other components of the fueling system are installed properly according to the component manufacturer's instructions and applicable codes.

- Emergency Power Cut-Off Switch
- Grounding system for all equipment
- Circuit Breakers
- Impact Box and Containment
- Verify all fuel lines are marked in containment box.
- Shear Valves
- Verify that piping layout in impact box / containment matches the footprint of the dispenser being installed. Verify supply line fuel grades and shear valve and conduit locations. Corrections are much easier prior to placing the dispenser on the island.
- Verify proper conduit is used for the area classification in which it is installed (i.e. Conduit and fittings are Class 1 Group C & D where req'd).
- Seal-off is installed as the first fitting on the conduit as it leaves the ground below the dispenser.
- Pump control relay box with provisions for isolation of control signals from dispensers.
- Pump - Dispenser must be installed in a system with a power operated pump incorporating a pressure relief that maintains system pressures at or below 50 psi. The pressure relief device must be located and verified as being installed as required.
- If a pump other than a submersible turbine pump is used, provisions must be made to prevent air from being pumped through the dispenser.

Requirements for Plumbing Installation

- Refer to drawing on Page 9-7 "Typical Installation" for dimensions.
- The dispenser must be installed with a shear valve on the supply line at the unit. Verify that all shear valves are mounted correctly according to the valve manufacturer's instructions and code requirements.



WARNING



Shear valves that are improperly installed or anchored may fail to operate correctly, causing a fire or explosion that results in severe injury or death. All shear valves must be installed and anchored per the manufacturer's instructions.

- Remove all shipping plugs and caps that may be present in piping, shear valves and unions.
- Ensure all pipe threads are properly cut and undamaged with the inside edge reamed to remove burrs.

- All contractor supplied pipe and fittings must be Schedule 40. All contractor supplied piping and fittings shall be black steel or stainless steel. All material must be compatible with the fuel being used.

WARNING

Gasoline blends containing 15% or more ethanol may not be compatible with certain materials and hydraulic components. Leaks or component failure may result, causing fire or explosion or environmental damage.

When dispensing gasoline blends containing 15% or more ethanol, consult the manufacturer of all fuel system components to verify compatibility with the fuel being dispensed. This includes the fuel dispenser itself.

- The **MSH** dispenser is supplied without unions on the supply and satellite feed connection points. A contractor provided union must be installed on top of each shear valve. Refer to valve manufacturer instructions for proper procedure to tighten union to shear valve.

WARNING

A shear valve may be damaged or broken if not properly supported when tightening fittings into it. The installer must use two wrenches to prevent stress from being applied to the shear point when tightening.

- The shear point of each shear valve must be within +/- 3/4" of the plane of the bottom of the dispenser base, or within valve manufacturer's installation requirement, whichever is less.
- The supply inlet connection on the dispenser is provided with a removable, NPT threaded flange for connection of piping to the dispenser.
- The vertical supply riser must be cut to the proper height in order to avoid stress on the dispenser.
- Clean all debris from pipes before assembly. Debris can damage the filter / strainer, allowing other foreign material to pass through, potentially damaging the dispenser.

Connecting Fuel Line(s) to Dispenser

Use the following procedure to pipe each shear valve to the associated connection point on the dispenser.

1. The installer must provide all piping and fittings necessary to connect the shear valve to the dispenser inlet. Use only schedule 40 black iron or stainless steel parts. Use only LISTED thread sealant that is approved for use with the appropriate fuel type. Follow manufacturer's instructions for the sealant's use.

Installation Instructions

- Loosely connect the union halves together and double check the alignment of the piping before tightening. Tighten the unions.
- Verify the shear point of each shear valve is within 3/4" of the plane of the bottom of the dispenser base.

WARNING

Prying or otherwise using excessive force to align an inlet pipe will stress components and may damage the shear valves, unions or other parts of the dispenser. Stressed or damaged components may fail and leak fuel causing a fire or explosion that can result in severe injury or death. Properly positioned shear valves should not require the inlet piping to be forced. It may be necessary to temporarily remove the dispenser from the island to align the shear valve(s) properly.

- Verify the shear valves are properly secured to the valve anchor bracket.
- All liquid carrying lines must be checked for leaks. Remember to allow all pipe compound to cure or set before performing the leak tests.
- Close the shear valve and leave closed until startup of the dispenser.

Mounting the Dispenser to the Island

The dispenser's footprint indicating the mounting / anchoring points on the pedestal's base and type of anchors to use are detailed in Figure 2-1 and 2-2. This structural footprint is common to all MSH models.

Anchor the dispenser pedestal to the fueling island using all four (4) on its foot.

- Use only 1/2-inch, Grade 5 (or above) steel hardware that is treated to prevent corrosion. Do not use plastic or lower grade hardware.

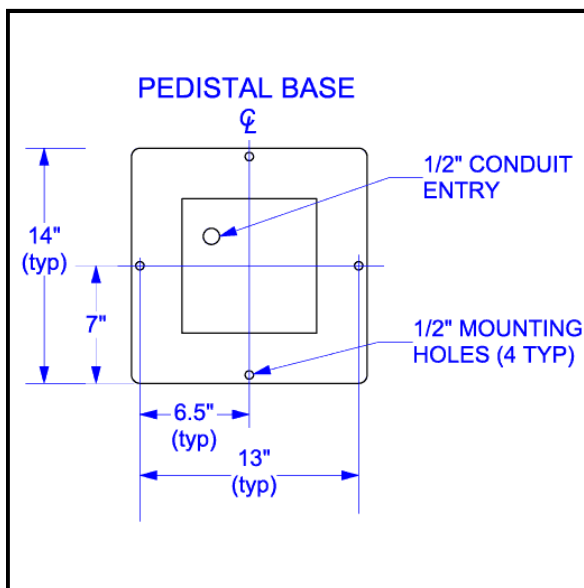


Figure 2-1: MSH Pedestal Structural Footprint

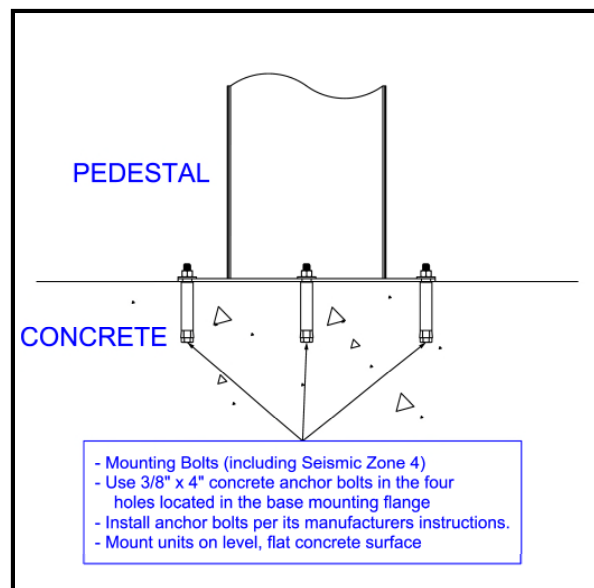


Figure 2-2: Typical Anchor Method to Concrete



WARNING



Improperly anchoring the dispenser can result in damage to the equipment, severe injury or death if the unit were to fall over due to impact or drive-off. The dispenser must be securely anchored per the instructions that follow.

2. Securely anchor the bolts / studs to the island or impact box.
3. Securely anchor the containment pan using heavy duty washers and nuts on the anchor bolts / studs. Tighten the nuts.

Requirements for Electrical Installation

- All electrical wiring must be done by a qualified, licensed electrician.
- Read, understand and follow this manual and all applicable materials / labeling supplied with this dispenser.



WARNING



The electrical work must conform with all applicable Federal, State and Local building / fire code requirements. This includes, but not limited to, NFPA (National Fire Protection Agency) 30 Flammable and Combustible Liquids Code , NFPA 30A Code for Motor Fuel Dispensing Facilities and Repair Garages and NFPA 70 National Electrical Code®. Failure to adhere to these requirements could result in severe injury or death.

CAUTION

Do not attempt to wire the dispenser without first reviewing the appropriate wiring diagrams and associated notes. Failure to follow the correct wiring diagrams may result in damage to the dispenser.

- All dispensers must be wired on the same phase.
- Only factory provided equipment is to be installed in the head of the dispenser.



WARNING



Unauthorized dispenser modifications may compromise the safety of the dispenser and create a condition that results in severe injury or death from fire, explosion or electric shock. Do not make, or allow to be made, any changes or modifications to the dispenser that are not factory authorized.

- All conduit and electrical fittings must be listed for use in Class 1, Division 1, Groups C & D hazardous locations. PVC or other non-metallic conduit is not acceptable.

- All threaded conduit connections must be drawn tight with a minimum of 5 threads of engagement.
- All field wiring must be connected in the main junction box.
- AC Neutral conductors must be solid WHITE or LIGHT GRAY.
- Ground conductors must be solid GREEN or GREEN with one or two YELLOW stripes.

 WARNING 
Performing work on a dispenser without first removing all power may result in electric shock, causing severe injury or death. All electricity must be turned off and tagged out prior to beginning any electrical work on the dispenser. More than one disconnect may be required. Use a digital multimeter to verify all power is off.

- Use only insulated, **STRANDED COPPER WIRE** that is properly sized, UL labeled and gasoline / oil resistant. Rated to 300V.
- All field wires must be color coded and/or labeled to facilitate equipment checkout and service.
- All wires must be pulled and connected as a continuous run to the dispenser switch box. Splices and field box terminal connectors are not permitted.
- Do not use gaskets or other sealing compounds on the cover of the explosion-proof switch box. The mating surfaces between the switch box and the cover must be clean and free of nicks or scratches.
- All required conduit seal-offs must be in place and poured when installation is complete.
- Make sure that all covers, plugs, etc. are in place and tight before replacing the dispenser's lower panels.

Ground

The **MSH** dispenser **MUST** be connected to an equipment grounding conductor located in the conduit as per National Electric Code, Article 250.

- Grounding conductor must be at minimum 12 AWG with insulation colored green or green with one or two yellow stripes.
- Grounding conductor must be connected to the equipment grounding terminal / lug in the dispenser's main switch box.
- A dedicated ground conductor from each dispenser to the electrical panel is required.
- Verify that the main electrical panel and all sub panels are properly grounded per NEC requirements.

Emergency Power Disconnect Switch

- One or more emergency power disconnect switches must be installed to control power to the entire fueling system. See NEC Article 514-5 and NFPA 30A for specifics.
- The emergency power disconnect switch is a single control point that simultaneously disconnects all power to the fueling system including the dispensers, pumps/STPs, lights, etc.
- If more than one disconnect is used, they must be interconnected so that activation of any one of them will disconnect electrical power.
- The emergency disconnect switch must be clearly marked and located in an accessible location between 20 and 100 feet from the fuel dispensers it serves.
- The disconnect switch must be one that can only be reset with manual intervention in a manner subject to approval by local authorities.



Circuit Breakers

- Power to each dispenser must be supplied from a dedicated **switched neutral circuit breaker**. No other equipment or dispensers shall be powered from it. A dedicated breaker allows for isolation of the dispenser.
- Use of two single pole breakers with handle ties is not permitted.
- The circuit breaker must be properly sized for the power load. Consult specifications for load of dispenser model being installed.

Pump Control



A motor control relay must be installed on the pump being controlled by the dispenser. The control relay allows the dispenser's control signal to control a high amperage/high voltage pump motor.

- When the control signal from more than one fueling point can activate a given pump motor, means must be provided to isolate the dispenser's control signals from one another.
- An isolation relay, or other means of isolation, must be provided for each pump control signal. Combination pump motor control relay & isolation relay interface boxes are recommended for ease of installation.

 WARNING 
<p>Failure to isolate the dispensers' control signals can result in electric shock from electricity back-feeding from one dispenser to another via these signals, resulting in severe injury or death. Ensure all dispenser control signals are isolated from one another.</p>
CAUTION
<p>Failure to isolate dispenser control signals can result in damage to the dispenser's electronics from cross phasing that occurs when signals from two or more dispensers powered by different AC phases are connected together. Ensure all dispensers are powered by the same phase (as mandated in Requirements for Electrical Installation). Additionally, ensure all dispenser control signals are isolated from those of other dispensers.</p>

Wiring the Dispenser

All field wire connections to the *MSH* dispenser are made in the switch box located in the lower cabinet of the dispenser.



 WARNING 
<p>Performing work on a dispenser without first removing all power may result in electric shock, causing severe injury or death. All electricity must be turned off and tagged out prior to beginning any electrical work on the dispenser. More than one disconnect may be required. Use a digital multimeter to verify all power is off.</p>
CAUTION
<p>Do not attempt to wire the dispenser without first reviewing the appropriate wiring diagrams and associated notes. Failure to follow the correct wiring diagrams may result in damage to the dispenser.</p>



1. Select the appropriate wiring diagram(s) for the installation. Select

the drawings from the “**Wiring Diagrams**” section of this manual. Study the diagram(s) and any notes that may be present.

2. Remove the top and rear door of the pedestal on the dispenser. Store the door in a safe manner so that they are not damaged.
3. Remove the cover from the main switch box. Store the cover and its four bolts for re-assembly later.
4. Verify that a conduit seal-off is the first fitting on the field conduit below the switch box.
5. Verify that all field wires to be connected to the dispenser are:
 - long enough to make connections in switch box
 - gas/oil resistant
 - identified in some manner to differentiate the connectors
5. Connect the field wiring conduit(s) below the dispenser to the switch box using conduit and fittings rated for Class 1 Division 1 Group C & D environments. Be careful not to damage or pinch the wires.
6. Test each wire conductor to verify that its insulation has not been damaged while being pulled through the conduit.
 - A. Wires to be tested **MUST** be disconnected at both ends.
 - B. Use a multimeter to measure resistance of each wire to ground.
 - C. Use a multimeter to measure resistance between all wires.
 - D. A reading of 50 Megaohms or greater for each test is acceptable.
 - E. Any wires that fail the test must be replaced.
 - F. After all wires have passed the insulation test, pour the seal-off fittings below the junction box.
7. Make all necessary connections as required by the wiring diagram(s) appropriate to the installation. Use only properly sized, Listed wire nuts to make the connections.
8. There should be no unused wires in the switch box. All wires in the switch box should be long enough to easily make the connection necessary without being excessively long. Extra wire can interfere with the operation of the switch.
9. Make sure all wires in the switch box are routed in such a way as to not interfere with the operation of the switch.
10. Replace the switch box cover using **all** four bolts removed in step 2 above. Make sure both metal surfaces are clean and no wires are pinched.
11. Replace the top and door on the pedestal of the dispenser.



Hose Assembly Requirements

 WARNING 
<p>Improper installation of the hanging hardware may result in the failure of the breakaway in the event of a drive-off, causing the hose assembly to rupture or the dispenser to be pulled over. A fire or explosion can occur, resulting in severe injury or death.</p> <p>All hanging hardware must be installed per manufacturer's instructions and in accordance with all applicable codes.</p>

 WARNING 
<p>Gasoline blends containing 15% or more ethanol may not be compatible with certain materials and hydraulic components. Leaks or component failure may result, causing fire or explosion or environmental damage.</p> <p>When dispensing gasoline blends containing 15% or more ethanol, consult the manufacturer of all fuel system components to verify compatibility with the fuel being dispensed. This includes the fuel dispenser itself.</p>

- All hoses and related hanging hardware must be Listed and installed per the manufacturer's instructions and in accordance with all applicable codes.
- Use only UL pipe sealant rated for the fuel being dispensed.
- Use pipe sealant on male threads only.
- DO NOT USE Teflon tape to seal fittings on the hose assembly. Teflon tape reduces the friction to the point that the fittings can easily be over-tightened, resulting in fractures or other failures of the fittings.
- Check ground continuity of the hose / nozzle assembly when finished.

Install Hanging Hardware

 WARNING 
<p>An improperly grounded nozzle spout can result in static discharge while fueling, igniting a fire / explosion, resulting in severe injury or death. Continuity must be present between the nozzle spout and the dispenser to prevent static discharge. All components of the hose assembly should be Listed . Continuity of each hose assembly must be tested and verified prior to use.</p>

Install the hanging hardware on the dispenser using the following procedure.

1. Clean all fittings to remove dirt and oil from their threads.
2. Install the short hose whip for the breakaway to the dispenser outlet.

3. Attach the breakaway to the hose whip. Follow the breakaway manufacturer's instructions.
4. Install the swivel in to the base of the nozzle. Follow the swivel and nozzle manufacturers' instructions. Only use nozzles listed on the "Installation Instructions" label located on the dispenser door near the main junction box.
5. Assemble the hose to the swivel / nozzle assembly. Follow the hose manufacturer's instructions.
6. Assemble the free end of the hose to the breakaway.
7. Check the entire hose assembly for continuity. Publication RP400 titled *Recommended Procedure for Testing Electrical Continuity of Fuel Dispensing Hanging Hardware*, published by the Petroleum Equipment Institute, should be used as a reference guide to perform the continuity tests.

Verify Proper Nozzle Fit

After installing the hose and nozzle on the dispenser, verify that the nozzle fits correctly into the dispenser's nozzle boot. If the nozzle does not fit correctly, it should be removed and cannot be used with the dispenser.

To verify proper fit:

1. Insert the hose nozzle valve over the nozzle hook and into the boot. The nozzle shall not slip out of the boot and the pump shall not operate.
2. The pump shall only operate when the nozzle is removed from the nozzle boot.
3. The pump shall stop when the nozzle is returned to into the nozzle boot.
4. The nozzle shall be able to be padlocked to the hanger or nozzle boot to prevent tampering and starting the pump motor so that no fluid can be discharged.

4 - STARTUP

Pre-Startup Checklist

The items in the following checklist must be inspected and verified as having been completed correctly prior to starting up the dispenser. All items should already be complete as required in previous sections. Only after the checklist is complete should power be applied to the dispenser.

- Power is turned off to the dispenser and associated product pump.
- The dispenser is securely anchored to the island using all four mounting locations in its base.
- All shear valves for dispensers being installed should be closed.
- Filters and strainers in dispenser are installed and tight.
- Dispenser is properly grounded.
- All conduit is complete.
- All unused conductors in junction boxes are capped off.
- All ports or openings in junction boxes or fittings must be plugged according to manufacturer's instructions.

CAUTION

The **MSH** dispenser **MUST NOT** be used to remove water from the storage tanks or damage to the unit can occur.

- Enough fuel is in the storage tank for proper operation of the pump(s).
- Any water in the storage tank has been removed.

CAUTION

Air must be purged from the fueling system slowly. Failure to follow the proper procedure as described can result in extensive damage to the dispenser's meter and will void the unit's warranty.

Purge Air from Supply Trunk Lines

All air must be purged from the dispenser and its product supply piping prior to beginning the startup procedure for the dispenser. The following procedure must be used to purge air from the supply piping.

1. Turn off all power to the product pump on the line being purged.
2. Verify that all shear valves on the product trunk and branch lines are closed.

3. Repeat steps 4 thru 10 for each product trunk and branch line.
4. Go to the dispenser furthest from the product pump on the trunk or branch line being purged.
5. Assemble a small ball valve to a 1/4" or 3/8" conductive hose that is compatible with the fuel in the line being purged. Make sure that the ball valve is closed.
6. Identify the shear valve associated with the line being purged and remove the plug from its test port. Connect the other end of the bleed hose to the test port using the appropriate NPT to hose fitting.



WARNING



Fire / explosions caused by sparks from static discharge are a potential danger anytime fuel is being dispensed, possibly causing serious injury or death. Use only approved, metallic containers and always keep the nozzle in contact with the container when fueling.

7. Place the ball valve in an approved metallic container. Keep the ball valve in contact with the container at all times while bleeding air.
8. Restore power to the product supply pump. Activate the pump.
9. Slowly open the ball valve and keep open until the air is purged and a steady stream of fuel is coming out of the ball valve. Close the ball valve. Be sure to maintain contact between the ball valve and the container to eliminate static buildup / discharge.
9. De-activate the product supply pump.
10. Disconnect power from the pump and dispenser using the appropriate breakers.
11. Place ball valve on the bleed line into the fuel container and open to relieve pressure on the supply line. Remove the hose / ball valve assembly from the test port of the shear valve.
12. Re-install the test port plug on the shear valve using listed sealant rated for the fuel being dispensed.

CAUTION

Air must be purged from the product trunk and branch lines ***PRIOR*** to purging air from the dispenser. Failure to purge the supply lines can result in damage to the dispenser meter.

Purge Air from the Dispenser

The following procedure must be used to purge air from the dispenser.

1. Turn off all power to the product pump for the dispenser being purged.

2. Operate the dispenser in STAND ALONE mode. See Wiring Diagrams in rear of this manual.
3. Make sure that the nozzles are hung in their proper boot.
4. Restore power to the dispenser and associated product pump.
5. Slowly open the dispenser's shear valve on the supply line.
6. Lift the associated nozzle from its boot and lift the boot lever to activate the pump and pressurize the line.
7. Verify that the correct supply pump has been activated.
8. Place the nozzle in the metallic container used earlier. Be sure to maintain contact between the nozzle and the container.

**WARNING**

Fire / explosions caused by sparks from static discharge are a potential danger anytime fuel is being dispensed, possibly causing serious injury or death. Use only approved, metallic containers and always keep the nozzle in contact with the container when fueling.

9. Slowly open the nozzle only part way, and hold, until air stops coming out and is replaced by a steady stream of fuel.
10. Open the nozzle valve at least half way and dispense about 40 to 50 gallons to eliminate all residual air in the lines / dispenser.
11. Hang up the nozzle in its boot.
13. Return all fuel dispensed to the appropriate product supply tank.
14. Disconnect power from the pump and dispenser using the appropriate breakers.
15. If testing is complete with this shear valve, remove the hose / ball valve assembly from its test port .
16. If the hose/valve assembly was removed in step 15, re-install the test port plug on the shear value using listed sealant rated for the fuel being dispensed.
17. Closely inspect the dispenser's hose assembly and internal piping for any signs of leaking fuel.
18. Repeat steps 1 to 17 for each hose/meter on the dispenser.

Verify Display and Totalizer Operation

Use the following procedure to properly startup the dispenser and prepare it to be placed into service. Before testing or operating the dispenser, air must have already been purged from the supply piping and the dispenser.

1. Restore power to the dispenser and pump with the appropriate breakers.
2. Record the current totalizer readings for the dispenser.
3. If the dispenser is used with an external control device such as a console or card access, authorize the dispenser using the external control device.
4. Remove the nozzle from the boot and lift the handle to activate the dispenser.
5. Dispense some fuel into an approved container, taking care not to spill any and not to over flow the container.
6. Observe the mechanical register to verify the counting looks smooth and consistent. Erratic or otherwise jumpy counting may indicate a problem with the meter or drive train from the meter to the register.
7. When finished dispensing, gently replace the nozzle in the boot and verify that the dispenser is deactivated.



WARNING



Fire / explosions caused by sparks from static discharge are a potential danger anytime fuel is being dispensed, possibly causing serious injury or death. Use only approved, metallic containers and always keep the nozzle in contact with the container when fueling.

8. To verify that the dispenser is no longer active, try to dispense more fuel into the container without lifting the nozzle boot lever. There should not be any fuel dispensed.
9. Verify that the supply pump has turned off.
10. Check the current totalizer readings with the ones recorded in step 4 above. Verify that the difference is the same as the amount of fuel dispensed.
11. Repeat steps 1 thru 13 for each hose position being started up.

Accuracy Verification of Meters

Verify / set the calibration of the dispenser meters using procedures from the **CALIBRATION** Section.

5 - CALIBRATION

All meters are tested, calibrated and sealed before a dispenser is shipped from the factory. However, the accuracy of the meter must be verified as part of the startup procedure.

Additionally, the meter used in the **MSH** dispenser may require a break-in period after initial installation, during which the meter's calibration can change slightly. It is strongly recommended that the accuracy of each meter be re-checked after 90 days with calibration changes made as necessary.

In custody transfer applications involving the resale of fuel, the meter must be sealed by the appropriate Weights and Measures authority before initial use and after any changes are made to its calibration.

Minimum Size of Calibration Container

The accuracy of the meters used in the dispenser must be verified using a certified calibration container. NIST Handbook 44 defines the minimum size of the calibration container required to verify the meter's accuracy. The size is determined by the maximum flow rate achieved by the installed meter. For flow rates less than 20 GPM, the container must be large enough to hold at least 5 gallons. For flow rates of 20 GPM or greater, the container must be large enough to allow the meter to operate at least one minute at full flow. Generally, the minimum calibration container size required to test the meter used in the MSH dispensers is 50 gallon. Note that this is a minimum size. It is permissible to use larger calibration containers than required.

Calibration Tolerances

TABLE 1: *(This table is for reference only. The tolerances that apply to the actual installation are determined by the local authority having jurisdiction.)*

Acceptance Tolerance	Maintenance Tolerance
<u>Liquid Control M-5 Meter</u>	<u>Liquid Control M-5 Meter</u>
50 gallon test (0.2%): +/- 23.1 in ³	50 gallon test (0.3%): +/- 34.6 in ³
100 gallon test (0.2%): +/- 46.2 in ³	100 gallon test (0.3%): +/- 69.3 in ³

Dispenser Calibration

Liquid Controls M-5 Meter

The adjuster access panel on the MSH dispenser is located just below the register on the meter. The following steps will allow the calibration to be set on the M-5.

1. Remove the adjuster housing dust cover. Remove the wire seal passing through the two bolts in the bottom of the cover. Next remove the bolts and the cover. Figure 3A shows the adjuster housing with the cover removed.
2. Check the dispensers current calibration setting by delivering product to a reliable, accurate prover. Perform several delivery tests at the normal flow rate to verify the repeatability.
3. Note and record the adjuster's current setting.
4. Note the volume in the prover. Calculate %correction by using the following formula:

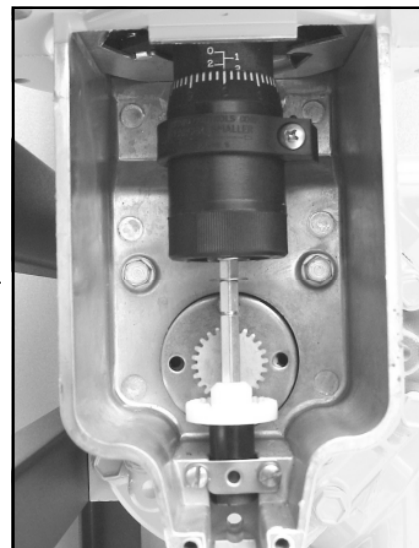


Figure 3A—Adjuster housing with cover removed

$$\% \text{ correction} = \frac{(\text{volume in prover}) - (\text{volume registered by dispenser})}{(\text{volume in prover})} \times 100$$

5. Loosen the adjuster clamp screw. See Figure 3B.
6. When the prover volume is **less** than the dispenser registered volume, add the %correction to the original adjuster setting by turning the thimble towards the arrow marked LARGER (volume). Correct the original setting by approaching the number desired from the next larger whole number. For example, assume a desired adjuster setting of 3.20. Turn the thimble to the left until 4.00 is reached, then back off until 3.20 is reached.
7. When the prover volume is **more** than the dispenser registered volume, subtract the %correction from the original adjuster setting by turning the thimble in the direction of the arrow marked SMALLER on the adjuster clamp (right).
8. Re-tighten the adjuster clamp screw. Run product through the dispenser to allow the adjuster to take a set.
9. Run another prover test to verify the new adjuster setting is correct.
10. Replace the dust cover and apply a wire seal to secure the adjuster settings.
11. Replace the adjuster access panel.

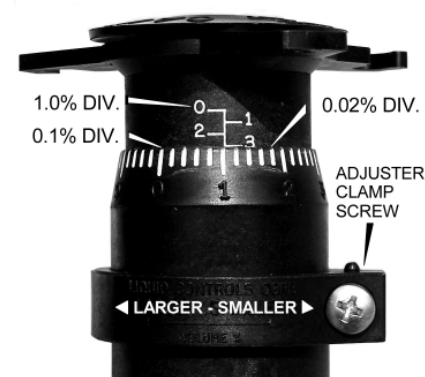


Figure 3B - Adjuster Detail

6 - OPERATING INSTRUCTIONS



WARNING



Per UL87A requirements, a dispenser must not be changed from its original application by changing fuel types once installed. For instance, if installed for a gasoline / ethanol blend such as E25 or E85, the dispenser can not be changed to traditional gasoline at a later date.

Leaks and potential environmental hazards can result or components may fail prematurely.

Do not change fuel types for a dispenser once it has been installed.

Prior to operating the dispenser, review the section “**IMPORTANT SAFETY INFORMATION**” at the front of this manual.

Dispenser Controls

The only user accessible controls on the dispenser are register reset knob and the nozzle boot lever that the nozzle rests on when it is placed in the boot. When a user wants to begin fueling, the register is reset and the nozzle is removed from the boot and the lever is raised. Lower the nozzle boot handle and return nozzle to boot to indicate that fueling is complete.

Dispenser Operating Sequence

1. Reset the mechanical counter mounted on top of the meter by turning the reset knob in the clockwise direction with your right hand.
2. Remove the nozzle from the boot and lift the lever.



WARNING



An engine can generate sparks when running, potentially igniting fuel / vapors. Never fuel a vehicle with its engine running.

3. If the dispenser is authorized to fuel, the solenoid valve will open and the fuel supply pump will turn on.
4. Dispense fuel. The fuel volume dispensed will appear on the face of the mechanical register mounted on the meter. The dispenser will remain active and able to dispense fuel until one of the following occurs:
 - The nozzle boot lever is lowered (turned off).
 - The external authorize (if used) is removed.
4. The transaction is complete:
 - The product supply pump is turned off.
 - The solenoid valve in the dispenser is closed.
 - The transaction information will remain on the register until it is reset..

7 - OWNER MAINTENANCE INSTRUCTIONS

The following section outlines maintenance procedures and routines for the MSH dispenser that can be performed by the operator. All maintenance and repairs involving the dispenser should only be performed by qualified and trained service personnel.



Safety Precautions

Prior to inspecting or performing any maintenance on the dispenser, review the section “**IMPORTANT SAFETY INFORMATION**” at the front of this manual. Failure to conform to safety procedures as outlined in this manual can result in severe injury or death.

Owner Inspections



The owner has a key role in maintaining the safe operation of the dispenser by performing equipment inspections on a periodic basis looking for leaks, worn or damaged parts, and any other hazards that may be present. When a hazard is identified, the dispenser should immediately be taken out of service and blocked off to prevent access to it. Only trained service personnel are to make the repairs necessary to fix the hazard.

Following is a recommended inspection routine to be performed by the station owner in order to identify potential hazards or other items that need to be repaired to maintain top performance and appearance of the dispenser. All safety precautions and procedures must be followed when performing the inspections. Any inspection or maintenance item not specifically covered should only be performed by trained service personnel.

 WARNING 	
<p>Inspecting, servicing or repairing a fuel dispenser is potentially dangerous due to the presence of flammable fuel / vapors and high voltage electricity.</p> <ul style="list-style-type: none">• Read and obey all safety precautions to prevent serious injury or death.• Barricade the lane(s) next to the dispenser to prevent access by vehicles and non-authorized personnel.• Wear gloves and proper eye protection.• Disconnect all power to the dispenser prior to opening any of its panels. More than one disconnect may be required. Use proper lockout / tag out procedures to secure the disconnect(s) in the off position.• Disconnect all power to the associated supply pump prior to opening any of the panels on the dispenser’s lower hydraulic cabinet. More than one disconnect may be required. Use proper lockout / tag out procedures to secure the disconnect(s) in the off position.• If accessing the interior of the pedestal, remove the lid and door and allow any vapors that may be present to disperse for a few minutes before beginning any work.	

 **WARNING** 

Using a dispenser with leaking, damaged or worn parts can create a condition that may result in serious injury or death from fire, explosion or electric shock. If leaks or damaged parts are discovered during an inspection, remove the dispenser from service and contact service personnel for repair.

 **WARNING** 

Servicing or repairing a dispenser incorrectly can result in serious injury or death from fire, explosion or electric shock. Only qualified and trained service personnel should service or perform repairs on the dispenser.

WEEKLY INSPECTIONS

- **External Leaks:** Check the dispenser for any external leaks. Check around the base of the dispenser for signs of a recent spill or leak. All leaking, damaged, or worn parts must be repaired immediately by qualified service personnel.
- **Hanging Hardware:** Check all hanging hardware closely for leaks, cracks, wear and damage. The components checked should include the hose, whip hose, breakaway, swivel and nozzle. Consult component manufacturer for any additional inspections required. All leaking, damaged, or worn parts must be replaced immediately by qualified service personnel.
- **Breakaway:** Verify that the breakaway connection is secure. If brake away is not secure, notify service personnel to correct or repair as necessary.
- **Nozzle Boot Lever:** Check nozzle boot lever for ease of movement by moving up and down several times. If lever sticks or does not have free movement over full range, contact trained service personnel to make repairs.
- **Panels / Locks:** Verify all panels and locks are in place on the dispenser. Do not operate the dispenser if a exterior panel or lock is missing or severely damaged.
- **Labels:** Verify all required safety and product labels on dispenser are present, legible and unobstructed.

MONTHLY INSPECTIONS

- **Internal Leaks:** Slowly remove the lower doors from the dispenser and check for any internal leaks. Refer to safety precautions detailed in the **WARNING** on page 6-1.
- **Filter** (if present): Check if filter needs replacement. Filter should be replaced every 250,000 gallons, every six months or when fuel flow slows significantly. Anytime a filter is replaced, the date and totalizer reading should be written on the new filter. Compare the current date and totalizer reading to that written on the filter last time it was replaced to determine if the filter should be replaced. If the filter needs replacement, contact the service personnel.

- **Mechanical Register:** Observe the register's display and look for fading or damage to the digits. Reset the register and verify that it completely resets to the zero (0.0) position.

Preventative Maintenance

The **MSH** dispensers are designed to give many years of trouble free service. However, like any mechanical device, they require periodic maintenance to prevent problems from developing.

PM Schedule (Owner)

The owner should only perform the following preventive maintenance items on the **MSH** dispensers. All other items not specifically outlined here should only be performed by trained service personnel.

MONTHLY MAINTENANCE (Owner / Operator)

1. **Clean the Dispenser:** Use a mild soap (such as Dawn dish detergent) and water with a soft cloth to clean the exterior of the dispenser. If stains persist, use a non-abrasive industrial cleaner, such as Simple Green, on the stains. Wipe off the dispenser with a clean rag and clean water to remove any soap residue. Cleaning the dispenser should be done more often in high corrosion environments.

CAUTION







Do not wash the dispenser with a pressurized water source. Water may be forced passed seals into the dispenser and damage components.

CAUTION

Do not use petroleum based or abrasive cleaners to clean the exterior of the dispenser as they can damage the finish.

Service / Inspections By Service Contractor

In addition to the periodic inspection and preventive maintenance schedule performed by the owner, the dispenser and fuel system should be fully inspected by qualified service personnel at least once a year. Many times, a trained observer can find problems / issues that may be overlooked. Anytime repairs, upgrades or modifications are made to the dispenser, the following WARNING information must be adhered to.

	WARNING	
<p>When making repairs to the dispenser's internal hydraulic system, only identical parts can be used. Substitute parts may compromise the reliability / safety of the dispenser and create a condition that results in severe injury or death from fire, explosion or electric shock.</p>		
	WARNING	
<p>Unauthorized dispenser modifications may compromise the safety of the dispenser and create a condition that results in severe injury or death from fire, explosion or electric shock. Do not make, or allow to be made, any changes or modifications to the dispenser that are not factory authorized.</p>		
	WARNING	
<p>Draining fuel from a section of the dispenser while performing service or repairs can result in a dry seal condition, leading to leaks. Leaking fuel poses both an environmental and safety hazard. Always replace seals and gaskets with new when servicing or repairing the dispenser.</p>		

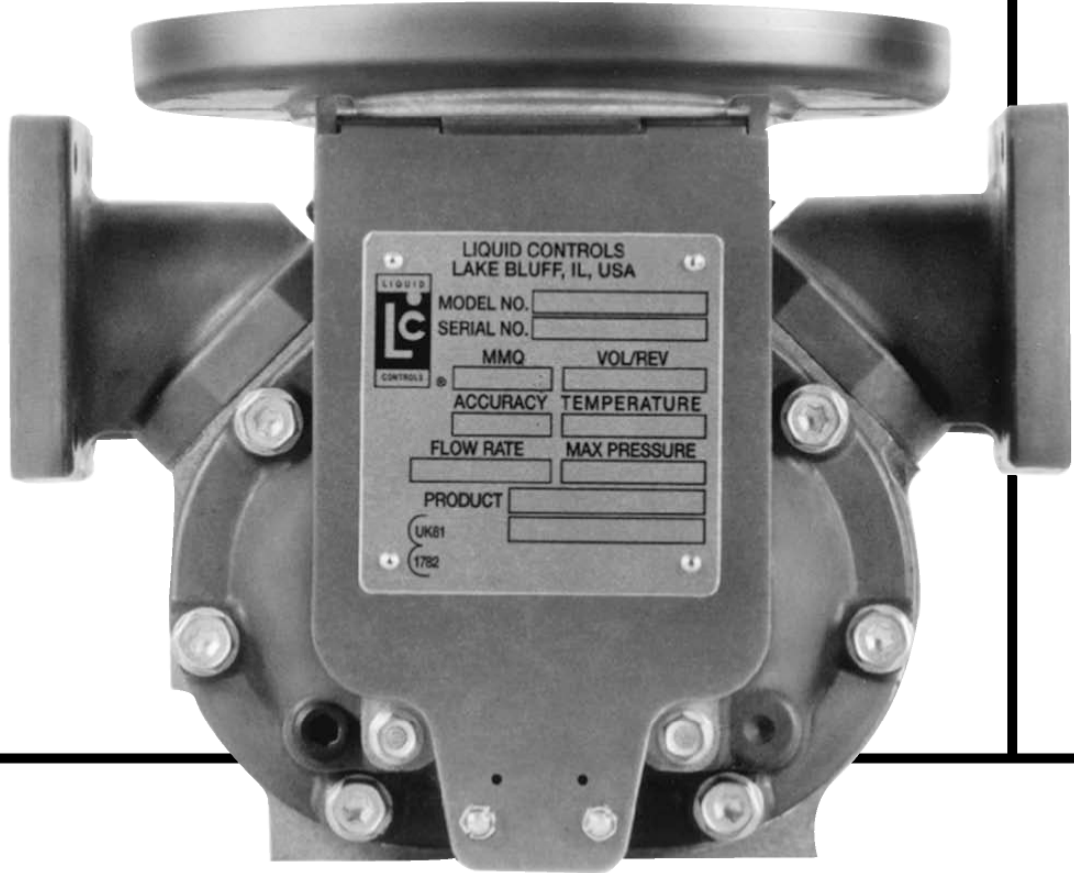
8 - PARTS INFORMATION

PARTS MANUAL



M-5®, MA-5®, MA-4®, & P9560 Series Meters

LIQUID CONTROLS A Unit of IDEX Corporation



LIQUID CONTROLS
LAKE BLUFF, IL, USA

MODEL NO.

SERIAL NO.

MMQ VOL/REV

ACCURACY TEMPERATURE

FLOW RATE MAX PRESSURE

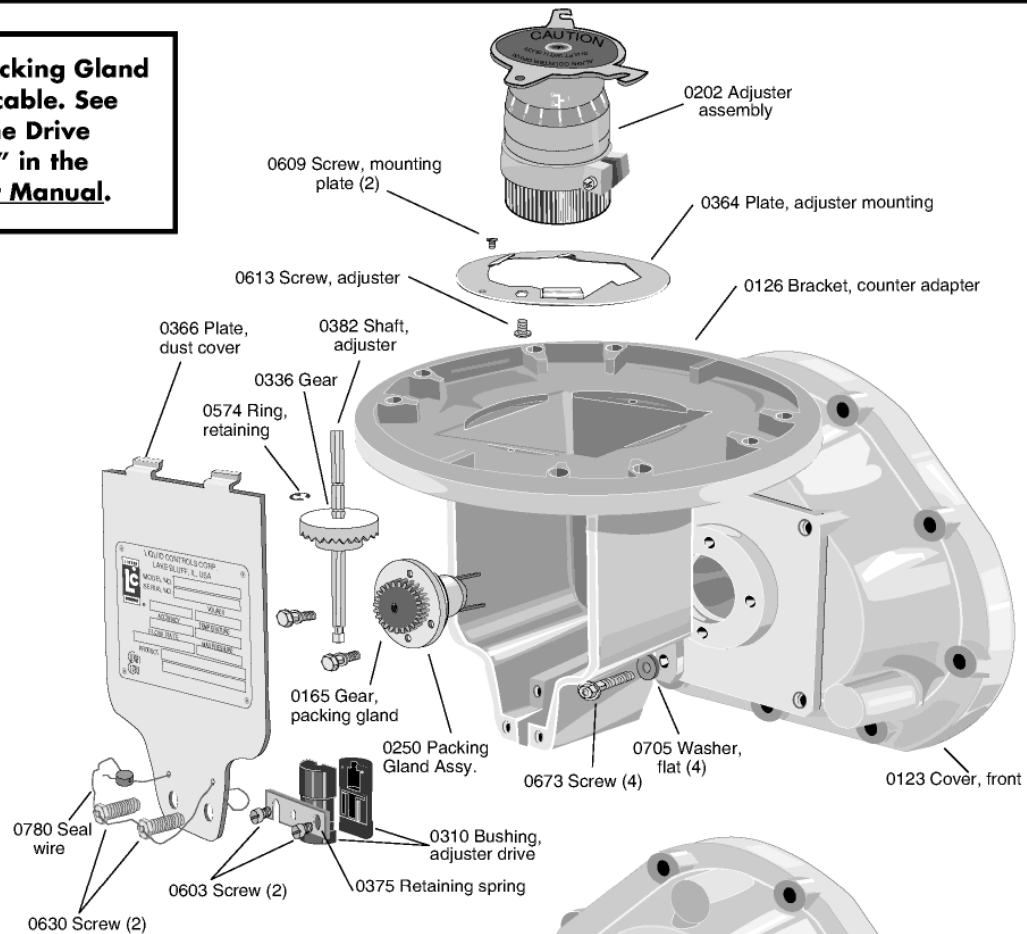
PRODUCT

UK81

1782

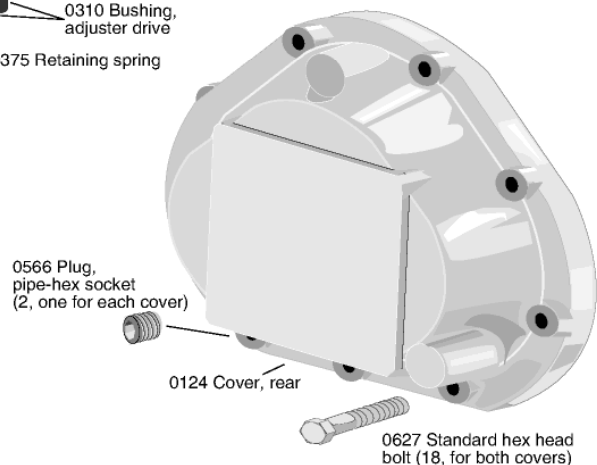
Exploded View: M-5/MA-5/MA-4 Meter Covers

The 0250 Packing Gland is field servicable. See "Servicing the Drive Components" in the M/MA Meter Manual.



How to Order Replacement Parts

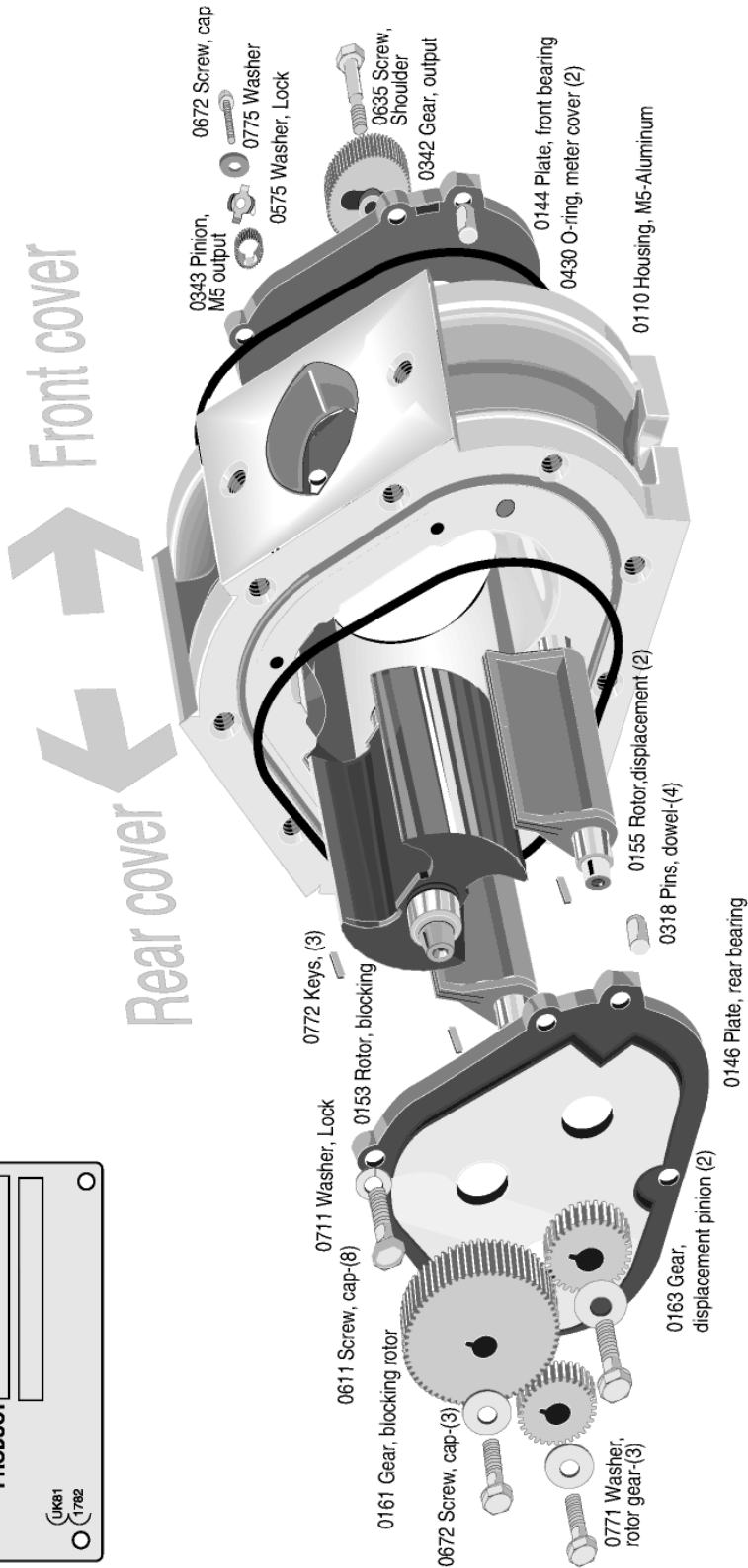
1. Find the item number listed on the exploded drawing. The 4 digit item numbers are listed with a word description.
2. Find the computer printout titled Parts List that has been provided with your meter. Look up the item number on the Parts List. The Parts List shows each item number with a corresponding part number. Find the corresponding 5 digit part number for the item you want to order. The part number represents an individual piece, a kit or a complete assembly.
3. Inform your distributor of the part number that you need. The part number is the only number that allows the distributor to find the correct component for your meter.



Exploded View: M-5/MA-5/MA-4 Meter Element

When placing order for replacement parts please reference the meter's serial number.

LIQUID CONTROLS LAKE BLUFF, IL, USA	
MODEL NO.	
SERIAL NO.	
MMQ	VOL/REV
ACCURACY	TEMPERATURE
FLOW RATE	MAX PRESSURE
PRODUCT	
UK81 1782	



OWNERS MANUAL PARTS LIST - M5A1 (Page 1)

COMPONENT	ITEM	PART#	DESCRIPTION	EEC APPROVED	QTY
		25075	NAMEPLATE, METER ASSY		1
	0678	00306	SCREW, DRV #2 x 0.19	TYPE 'U'	4
	0372	49368	NAMEPLATE, METERS	WITH EEC APPROVAL	1
COMPONENT		L1102	METER ELEMENT	M-5-1 FOR FORK DRIVE	1
	0678	00306	SCREW, DRV #2 x 0.19	TYPE 'U'	2
	0611	09079	SCREW, #10-24 X 0.625	HX HD, SEMS, SS	8
	0672	09079	SCREW, #8-32 X 0.750 LG	HEX HD 18-8 STAINLESS STL	4
	0318	40665	PIN, DOWEL	0.250 DIA X 0.625 LOND	4
	0146	44286	PLATE, REAR BEARING	R B/P SV-1-2-3-7-14	1
	0144	44287	PLATE, FRONT BEARING	FR B/P SV-1-2-3-7-14	1
	0155	48078	ROTOR ASSY, DISP M5	ALUM / SS HC	2
	0153	48079	ROTOR, BLKG ASSY M5	ALUM / SS HC	1
	0163	48089	GEAR, DISPL PINION M5	SINTERED IRON, TAPER	2
	0161	48090	GEAR, BLOCKING M5	SINTERED IRON, TAPER	1
	0343	48257	PINION, M5 OUTPUT	SST 32P, 18T	1
	0110	48271	HOUSING, M5 ALUMINUM	FOR 2 BOLT ELBOWS	1
	0635	48275	SCREW, SHOULDER 0.25D	M5 OUTPUT GEAR	1
	0342	48276	GEAR, OUTPUT M5	SINTERED IRON 32P 54T	1
	0575	48277	WASHER, LOCK M5	OUTPUT PINION	1
	0771	48319	WASHER, ROTOR GEAR	0.19 ID, 0.62 OD, 301 SS	1
	0772	48345	KEY, ROTOR GEAR M5	0.093 X 0.125 X 0.437	3
COMPONENT		25109	COVER ASSY M5	ALUM COVERS, NEW STYLE	1
	0566	06790	PIPE PLUG, 0.250-18 NPT	HEX SCKT HD, 302 SS	2
	0627	09080	SCREW, 0.312-18 X 1.375	HEX WSHR HD, THD FRMG	18
	0123	48272	COVER, FRONT M5	ALUM, NEW STYLE	1
	0124	48273	COVER, REAR M5	ALUM, NEW STYLE	1
COMPONENT		25127	SEAL KIT	M/MA 5 UL BUNA ALUM	1
	0430	09278	O-RING, 5.267 ID BUNA, UL	5.435 OD X 0.099 THK (SQR)	2
COMPONENT		48600	PACK GLAND ASSY	AL / BUNA / W/ FORK DRIVER	1
	0010	06856	O-RING, 0.88 ID BUNA -N	1.12 OD X 0.12 DIA WAL	1
	0012	09079	SCREW, #10-24 X 0.625	HX HD, SEMS, SS	2
	0005	09113	RETAINING RING 0.141	NTRNL "E"	1
	0009	09172	WASHER, 0.194 ID X 0.375 OD	X 0.032 THICK NYLON	1
	0006	09221	SEAL, HUVA CUP; 0.188 ID	0.375 OD, 0.09 THK, BUNA	1
	0004	48281	SHAFT, PACKING GLAND	316 SST/HC, NS	1
	0002	48282	DRIVER, PACKING GLAND	NS METER OUTPUT	1
	0007	48285	THRUST WASHER, RULON	NS PACKING GLAND	1
	0008	48286	THRUST WASHER, 316 SST	NS PACKING GLAND	1
	0011	48331	PLATE, RETAINING	NS PACKING GLAND, SST	1
	0001	49612	HOUSING ASSY, PKG GLAND	ALUM HSG / FORK DRIVE	1

OWNERS MANUAL PARTS LIST - M5A1 (Page 2)

COMPONENT	ITEM	PART#	DESCRIPTION	QTY	
		25170	ADAPTER, COUNTER ASSY	M5, 7 & 15 ALUMINUM	1
	0705	06743	FLAT WASHER, 0.265 ID	0.500 OD X 0.062 THK	4
	0603	06845	SCREW, #10-24 X 0.375	FLLSTR HD, 316 SS	2
	0673	09084	SCREW, 1/4-20 X 1.00	INDT HEX WSHR HD, GR 8	4
	0375	48208	RETAINER, BUSHING	ADJUSTER DRIVE SFT/BSHG	1
	0126	49434	ADAPTER, COUNTER BRKT	FOR M5, M7 & M15 METERS	1
COMPONENT		25175	DUST COVER ASSY	M5, 7, & 15 ALL BUT SS	1
	0630	09093	SCREW, #10-32 X 0.500	TAPTITE W/ CROSS HOLE	2
	0366	49390	PLATE, ADJUSTER COVER	ALUM, M5, 7 & MA15	1
COMPONENT		25000	ADJUSTER ASSY	STD ADJUSTER	1
	0609	00362	SCREW #6-32 X 0.25	SLTTD PAN HD, SHKPRF	2
	0613	07063	SCREW, 1/4-20 X 0.375	SLTD RDH SLFTPG TYP 23	1
	0202	42600	ADJUSTER ASSY	ADJ N/S	1
	0364	42660	PLATE, ADJUSTER MTG	MTG PLATE ADJ N/S	1
COMPONENT		25150	DRIVE SHAFT ASSY	M5, M7 & M15 - NEW STYLE	1
	0574	02188	RETAINING RING, 0.250	XTRNL "E"	1
	0310	41786	BUSHING, ADJUSTER DRIVE	BUSHING ADJ DR M15, M30	2
	0382	48287	SHAFT, 0.25 HEX ADJ DRV	M5 / M7 / M15 STD & ROF	1
COMPONENT		A1070	ELBOW ASSY, M5 - 2 BOLT	ALUM / BUNA - 1.5" 45 DEG	2
	0003	09082	SCREW, 3/8-16 X 1.375"	HX WSHR HD, T45, SS	4
	0002	09117	O-RING, 2.31 ID BUNA-N	2.50" OD X 0.09 DIA WALL	2
	0001	48290	ELBOW, M-5 2 BOLT	1-1/2" 45 DEGREE	2
COMPONENT		A2110	FLANGE ASSY, M5 & M7	ALUM / BUNA / 1-1/2" NPT	2
	0750	04498	FLAT WASHER, 0.406 ID	0.812 OD X 0.062 THK	8
	0420	06854	O-RING, 2.88" ID BUNA-N UL	3.12 OD X 0.12 DIA WALL	2
	0135	48397	FLANGE, COMP; 1-1/2" NPT	ALUM, O-RING STYLE	2
	0620	06851	SCREW, 3/8-16 X 1.500	HEX HD CAP, GR 8	8
COMPONENT		25050	FACE GEAR & PINION ASSY	1:1 W / DELRIN FACE GR	1
	0336	40122	GEAR, FACE	1:1 DELRIN	1
	0165	48283	GEAR, PKG GLAND 1:1	24 TOOTH, PM, NS	1

<h2 style="margin: 0;">Installation & Maintenance Instructions</h2> <p style="margin: 5px 0 0 0;">2-WAY INTERNAL PILOT-OPERATED SOLENOID VALVES NORMALLY CLOSED OPERATION — GENERAL SERVICE 1", 1¼" OR 1½" NPT</p>	<p style="margin: 0;">SERIES</p> <p style="margin: 5px 0 0 0;">8210</p> <p style="margin: 5px 0 0 0;">8211</p> <p style="margin: 5px 0 0 0;">I&M No.V5436R7</p>
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NOTICE: See separate solenoid installation and maintenance instructions for information on: **Wiring, Solenoid Temperature, Cause of Improper Operation, Coil or Solenoid Replacement.**

DESCRIPTION

Series 8210 valves are 2-way normally closed internal pilot-operated solenoid valves designed for general service. Valves are made of rugged forged brass. Series 8210 valves are provided with a general purpose solenoid enclosure. Series EF8210 and 8211 are the same as Series 8210 except they are provided with an explosionproof or explosionproof/watertight solenoid enclosure.

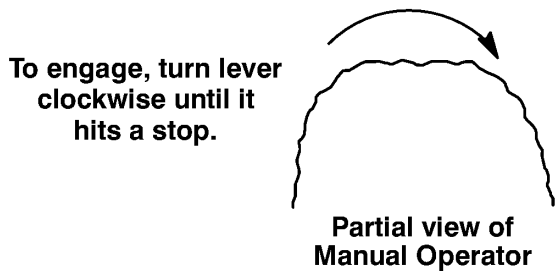
OPERATION

Normally Closed: Valve is closed when solenoid is de-energized; open when energized.

IMPORTANT: Minimum operating pressure differential is 5 psi.

Manual Operator (optional feature)

Manual operator allows manual operation when desired or during an electrical power outage. To engage manual operator (open the valve), turn lever clockwise until it hits a stop. Valve will now be in the same position as when the solenoid is energized. To disengage manual operator (close the valve), turn lever counterclockwise until it hits a stop.



CAUTION: For valve to operate electrically, manual operator lever must be fully rotated counterclockwise.

INSTALLATION

Check nameplate for correct catalog number, pressure, voltage, frequency, and service. Never apply incompatible fluids or exceed pressure rating of the valve. Installation and valve maintenance to be performed by qualified personnel.

Future Service Considerations

Provision should be made for performing seat leakage, external leakage, and operational tests on the valve with a nonhazardous, noncombustible fluid after disassembly and reassembly.

Temperature Limitations

For maximum valve ambient and fluid temperatures, refer to chart below. Check catalog number prefix and watt rating on nameplate.

Watt Rating AC/DC	Catalog Number Prefix	Solenoid Class	Maximum Ambient Temp.	Maximum Fluid Temp.
6 AC	None or DF	F	122°F (50°C)	180°F (82°C)
	HT	H	140°F (60°C)	180°F (82°C)
6.1 AC	None, KF, SF or SC	F	125°F (54°C)	180°F (82°C)
	HT, KH, ST or SU	H	140°F (60°C)	180°F (82°C)
11.2 DC	None or HT	F or H	77°F (25°C)	150°F (65°C)
11.6 DC	None, HT, KF, KH, SC, SF or ST	F or H	104°F (40°C)	150°F (65°C)

Positioning

This valve is designed to perform properly when mounted in any position. However, for optimum life and performance, the solenoid should be mounted vertically and upright to reduce the possibility of foreign matter accumulating in the solenoid base sub-assembly area.

Piping

Connect piping to valve according to markings on valve body. Apply pipe compound sparingly to male pipe threads only. If applied to valve threads, the compound may enter the valve and cause operational difficulty. Avoid pipe strain by properly supporting and aligning piping. When tightening the pipe, do not use valve or solenoid as a lever. Locate wrenches applied to valve body or piping as close as possible to connection point.

CAUTION: To protect the solenoid valve, install a strainer or filter suitable for the service involved in the inlet side as close to the valve as possible. Clean periodically depending on service conditions. See ASCO Series 8600, 8601 and 8602 for strainers.

MAINTENANCE

WARNING: To prevent the possibility of death, serious injury or property damage, turn off electrical power, depressurize valve, and vent fluid to a safe area before servicing the valve.

NOTE: It is not necessary to remove the valve from the pipeline for repairs.

Cleaning

All solenoid valves should be cleaned periodically. The time between cleanings will vary depending on the medium and service conditions. In general, if the voltage to the coil is correct, sluggish valve operation, excessive noise or leakage will indicate that cleaning is required. In the extreme case, faulty valve operation will occur and the valve may fail to open or close. Clean strainer or filter when cleaning the valve.

Preventive Maintenance

- Keep medium flowing through the valve as free from dirt and foreign material as possible.
- Periodic exercise of the valve should be considered if ambient or fluid conditions are such that corrosion, elastomer degradation, fluid contamination build up, or other conditions that could impede solenoid valve shifting are possible. The actual frequency of exercise necessary will depend on specific operating conditions. A successful operating history is the best indication of a proper interval between exercise cycles.
- Depending on the medium and service conditions, periodic inspection of internal valve parts for damage or excessive wear is recommended. Thoroughly clean all parts. If parts are worn or damaged, install a complete rebuild kit.

Causes of Improper Operation

- **Incorrect Pressure:** Check valve pressure. Pressure to valve must be within range specified on nameplate.
- **Excessive Leakage:** Disassemble valve and clean all parts. If parts are worn or damaged, install a complete ASCO Rebuild Kit.

Valve Disassembly

1. Disassemble valve in an orderly fashion using exploded views for identification and placement of parts. Refer to Figure 1 for AC construction; Figure 2 for DC construction. For 1" or 1 1/4" NPT valve construction, see Figure 1; for 1 1/2" NPT valve construction, see Figure 2.
 2. Remove solenoid enclosure. See separate instructions.
- For valves supplied with optional manual operators, see section on *Disassembly of Manual Operator*.
 - 3. Unscrew solenoid base sub-assembly from valve body. Then remove core assembly with core spring and solenoid base gasket. For AC construction (Figure 1) core spring is a loose piece.
 - 4. For normal maintenance (cleaning) it is not necessary to remove the valve seat. However, for valve seat removal use a 7/16" thin wall socket wrench
 - 5. Remove bonnet screws, valve bonnet, diaphragm spring, diaphragm assembly, body gasket, body passage eyelet (present on current valve constructions only) and body passage gasket.
 - 6. All parts are now accessible for cleaning or replacement. If parts are worn or damaged, install a complete ASCO Rebuild Kit.

— Service Notice —

When installing a new ASCO Rebuild Kit, please be aware that the diaphragm assembly may not be identical to the diaphragm assembly in the valve. See Figure 1 for alternate diaphragm constructions. The two diaphragm constructions are interchangeable and will perform equally well.

CAUTION: To ensure proper valve operation, install all parts supplied in ASCO Rebuild Kit. Do not mix old and new parts.

Valve Reassembly

1. Lubricate body gasket, body passage gasket, bonnet gasket and solenoid base gasket with DOW CORNING® 200 Fluid lubricant or an equivalent high-grade silicone fluid.

2. Install body passage gasket, body passage eyelet, diaphragm assembly, diaphragm spring, valve bonnet and bonnet screws. Hand thread screws as far as possible. Then torque bonnet screws in a crisscross manner to 144 ± 15 in-lbs [16,3 ± 1,7 Nm].
3. If removed, install valve seat in valve body. Apply a small amount of thread compound compatible with valve media to valve seat threads. Torque valve seat to 75 ± 10 in-lbs [8,5 ± 1,1 Nm].

- For valves supplied with optional manual operator, see section on *Reassembly of Manual Operator*.

4. For AC construction (Figure 1), install core spring in core assembly. Wide end of core spring in core first, closed end protrudes from top of core.
5. Install solenoid base gasket, core assembly with core spring and solenoid base sub-assembly in valve body. Torque solenoid base sub-assembly to 175 ± 25 in-lbs [19,8 ± 2,8 Nm].
6. Install solenoid. See separate instructions.

WARNING: To prevent the possibility of death, serious injury or property damage, check valve for proper operation before returning to service. Also perform internal seat and external leakage tests with a nonhazardous, noncombustible fluid.

7. Restore line pressure and electrical power supply to valve.
8. After maintenance is completed, operate the valve a few times to be sure of proper operation. A metallic *click* indicates the solenoid is operating.

Disassembly of Manual Operator

1. Unscrew solenoid base sub-assembly from manual operator body.
2. Unscrew manual operator body from valve body. Then remove stem retainer from base of manual operator body and stem/spacer sub-assembly.
3. Pull stem/spacer sub-assembly with stem gasket from side of manual operator body. Then remove core assembly with core spring, solenoid base gasket and manual operator bonnet gasket.
4. For further disassembly refer to section on *Valve Disassembly* step 4.

Reassembly of Manual Operator

1. Lubricate stem gasket with DOW CORNING® 111 Compound lubricant or an equivalent high-grade silicone grease.
2. For AC construction (Figure 1), install core spring in core assembly. Wide end of core spring in core first, closed end protrudes from top of core.
3. Holding the manual operator body in a horizontal position, install core assembly with core spring from the bottom end.
4. Insert the stem/spacer sub-assembly with the stem gasket into the side hole of the manual operator body. Rotate the lever of the stem/spacer sub-assembly to the 12 o'clock position.
5. Install stem retainer on base of manual operator body and simultaneously engage it into the slot provided on the stem/spacer sub-assembly.

IMPORTANT: The spacer on the stem/spacer sub-assembly must be inside of the stem retainer for AC construction (Figure 1) and outside of the stem retainer for DC construction (Figure 2).

6. Install manual operator bonnet gasket and body with preassembled parts into valve body. Torque manual operator body to 175 ± 25 in-lbs [19,8 ± 2,8 Nm].
7. Replace solenoid base gasket and solenoid base sub-assembly. Torque solenoid base sub-assembly to 175 ± 25 in-lbs [19,8 ± 2,8 Nm].
8. For further reassembly, refer to *Valve Reassembly* step 6.

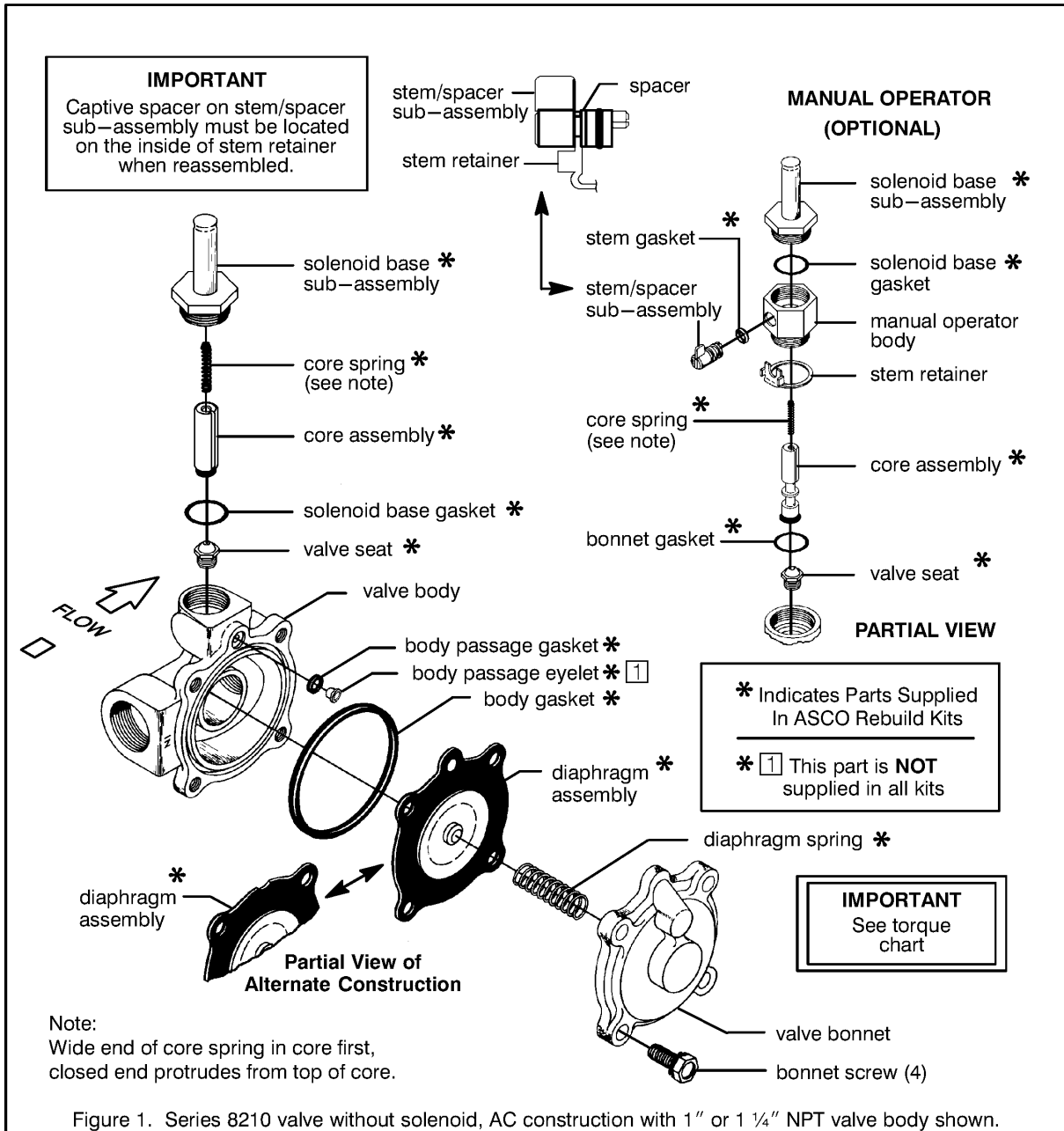


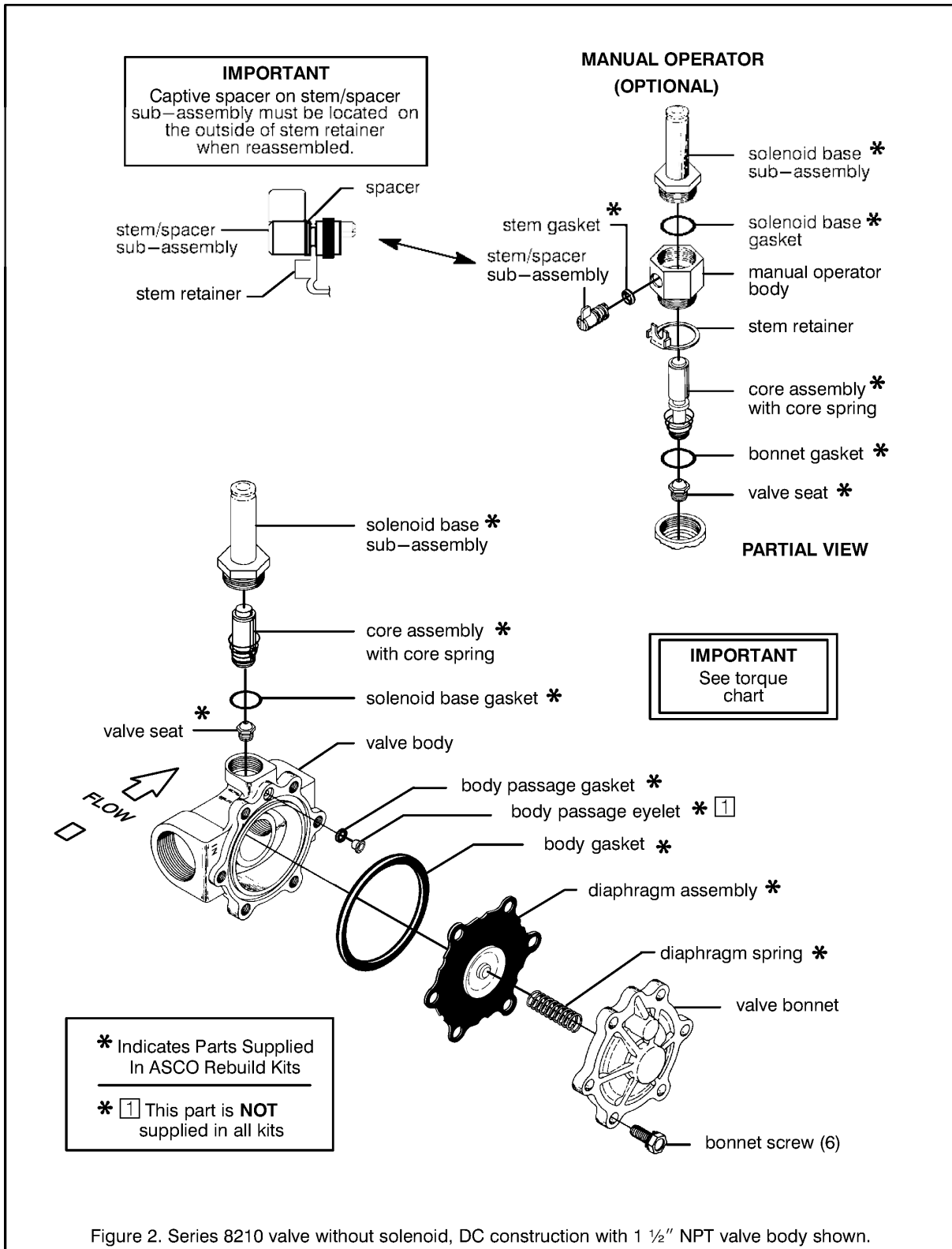
Torque Chart

Part Name	Torque Value Inch-Pounds	Torque Value Newton-Meters
Solenoid base sub-assembly	175 ± 25	19,8 ± 2,8
Manual operator body		
Bonnet screw	144 ± 15	16,3 ± 1,7
Valve seat	75 ± 10	8,5 ± 1,1

**ORDERING INFORMATION
FOR ASCO REBUILD KITS**

Parts marked with an asterisk (*) in the exploded view are supplied in Rebuild Kits. When Ordering Rebuild Kits for ASCO valves, order the Rebuild Kit number stamped on the valve nameplate. If the number of the kit is not visible, order by indicating the number of kits required, and the Catalog Number and Serial Number of the valve(s) for which they are intended.





<h1 style="margin: 0;">Installation & Maintenance Instructions</h1> <p style="margin: 0;">®</p>	<p>SERIES</p> <p>8016G</p>
<p>OPEN-FRAME, GENERAL PURPOSE, WATERTIGHT/EXPLOSIONPROOF SOLENOIDS</p>	<p>Form No.V6583R7</p>

—SERVICE NOTICE—

ASCO® solenoid valves with design change letter “G” in the catalog number (example: 8210G 1) have an epoxy encapsulated ASCO® Red Hat II® solenoid. This solenoid replaces some of the solenoids with metal enclosures and open-frame constructions. Follow these installation and maintenance instructions if your valve or operator uses this solenoid.

DESCRIPTION

Catalog numbers 8016G1 and 8016G2 are epoxy encapsulated pull-type solenoids. The green solenoid with lead wires and 1/2” conduit connection is designed to meet Enclosure Type 1—General Purpose, Type 2—Dripproof, Types 3 and 3S—Raintight, and Types 4 and 4X—Watertight. The black solenoid on catalog numbers prefixed “EF” is designed to meet Enclosure Types 3 and 3S—Raintight, Types 4 and 4X—Watertight, Types 6 and 6P—Submersible, Type 7 (A, B, C, & D) Explosionproof Class I, Division 1, Groups A, B, C, & D and Type 9 (E, F, & G)—Dust—Ignitionproof Class II, Division 1, Groups E, F, & G. The Class II, Groups F & G Dust Locations designation is not applicable for solenoids or solenoid valves used for steam service or when a class “H” solenoid is used. See *Temperature Limitations* section for solenoid identification and nameplate/retainer for service. When installed just as a solenoid and not attached to an ASCO valve, the core has a 0.250–28 UNF–2B tapped hole, 0.38 minimum full thread.

Series 8016G solenoids are available in:

- **Open-Frame Construction**
The green solenoid may be supplied with 1/4” spade, screw, or DIN terminals (Refer to Figure 4).
- **Panel Mounted Construction**
These solenoids are specifically designed to be panel mounted by the customer through a panel having a .062 to .093 maximum wall thickness. (Refer to Figure 3 and section on *Installation of Panel Mounted Solenoid*).

Optional Features For Type 1 – General Purpose Construction Only

- **Junction Box**
This junction box construction meets Enclosure Types 2,3,3S,4, and 4X. Only solenoids with 1/4” spade or screw terminals may have a junction box. The junction box provides a 1/2” conduit connection, grounding and spade or screw terminal connections within the junction box (See Figure 5).
- **DIN Plug Connector Kit No. K236034**
Use this kit only for solenoids with DIN terminals. The DIN plug connector kit provides a two pole with grounding contact DIN Type 43650 construction (See Figure 6).

OPERATION

When the solenoid is energized, the core is drawn into the solenoid base sub-assembly. **IMPORTANT: When the solenoid is de-energized, the initial return force for the core, whether developed by spring, pressure, or weight, must exert a minimum force to overcome residual magnetism created by the solenoid. Minimum return force for AC construction is 11 ounces, and 4 ounces for DC construction.**

INSTALLATION

Check nameplate for correct catalog number, service, and wattage. Check front of solenoid for voltage and frequency.

WARNING: Electrical hazard from the accessibility of live parts. To prevent the possibility of death, serious injury or property damage, install the open – frame solenoid in an enclosure.

FOR BLACK ENCLOSURE TYPES 7 AND 9 ONLY

CAUTION: To prevent fire or explosion, do not install solenoid and/or valve where ignition temperature of hazardous atmosphere is less than 165° C. On valves used for steam service or when a class “HP” solenoid is used, do not install in hazardous atmosphere where ignition temperature is less than 180° C. See nameplate/retainer for service.

NOTE: These solenoids have an internal non-resettable thermal fuse to limit solenoid temperature in the event that extraordinary conditions occur which could cause excessive temperatures. These conditions include high input voltage, a jammed core, excessive ambient temperature or a shorted solenoid, etc. This unique feature is a standard feature only in solenoids with black explosionproof/dust-ignitionproof enclosures (Types 7 & 9).

CAUTION: To protect the solenoid valve or operator, install a strainer or filter, suitable for the service involved in the inlet side as close to the valve or operator as possible. Clean periodically depending on service conditions. See ASCO Series 8600, 8601, and 8602 for strainers.

Temperature Limitations

For maximum valve ambient temperatures, refer to chart. The temperature limitations listed, only indicate maximum application temperatures for field wiring rated at 90°C. Check catalog number prefix and watt rating on nameplate to determine maximum ambient temperature. See valve installation and maintenance instructions for maximum fluid temperature. NOTE: For steam service, refer to *Wiring* section, *Junction Box* for temperature rating of supply wires.

Temperature Limitations For Series 8016G Solenoids for use on Valves Rated at 6.1, 8.1, 9.1, 10.6, or 11.1 Watts			
Watt Rating	Catalog Number Coil Prefix	Class of Insulation	Maximum † Ambient Temp.
6.1, 8.1, 9.1, & 11.1	None, FB, KF, KP, SF, SP, SC, & SD	F	125°F (51.7°C)
6.1, 8.1, 9.1, & 11.1	HB, HT, KB, KH, SS, ST, SU, & ST	H	140°F (60°C)
10.6	None, KF, SF, & SC	F	104°F (40°C)
10.6	HT, KH, SU, & ST	H	104°F (40°C)

†Minimum ambient temperature –40°F (–40° C).

Positioning

This solenoid is designed to perform properly when mounted in any position. However, for optimum life and performance, the solenoid should be mounted vertically and upright to reduce the possibility of foreign matter accumulating in the solenoid base sub-assembly area.

Wiring

Wiring must comply with local codes and the National Electrical Code. All solenoids supplied with lead wires are provided with a grounding wire which is green or green with yellow stripes and a 1/2” conduit connection. To facilitate wiring, the solenoid may be rotated 360°. For the watertight and explosionproof solenoid, electrical fittings must be approved for use in the approved hazardous locations.

Additional Wiring Instructions For Optional Features:

- **Open-Frame solenoid with 1/4” spade terminals**
For solenoids supplied with screw terminal connections use #12–18 AWG stranded copper wire rated at 90°C or greater. Torque terminal block screws to

10 ± 2 in-lbs [1,0 ± 1,2 Nm]. A tapped hole is provided in the solenoid for grounding, use a #10–32 machine screw. Torque grounding screw to 15 – 20 in-lbs [1,7 – 2,3 Nm]. On solenoids with screw terminals, the socket head screw holding the terminal block to the solenoid is the grounding screw. Torque the screw to 15 – 20 in-lbs [1,7 – 2,3 Nm], with a 5/32" hex key wrench.

• Junction Box

The junction box is used with spade or screw terminal solenoids only and is provided with a grounding screw and a 1/2" conduit connection. Connect #12–18 AWG standard copper wire only to the screw terminals. Within the junction box use field wire that is rated 90°C or greater for connections. For steam service use 105°C rated wire up to 50 psi or use 125°C rated wire above 50 psi. After electrical hookup, replace cover gasket, cover, and screws. Tighten screws evenly in a crisscross manner.

• DIN Plug Connector Kit No.K236–034

1. The open-frame solenoid is provided with DIN terminals to accommodate the DIN plug connector kit.
2. Remove center screw from plug connector. Using a small screwdriver, pry terminal block from connector cover.
3. Use #12–18 AWG stranded copper wire rated at 90°C or greater for connections. Strip wire leads back approximately 1/4" for installation in socket terminals. The use of wire-end sleeves is also recommended for these socket terminals. Maximum length of wire-end sleeves to be approximately 1/4". Tinning of the ends of the lead wires is not recommended.
4. Thread wire through gland nut, gland gasket, washer, and connector cover.

NOTE: Connector cover may be rotated in 90° increments from position shown for alternate positioning of cable entry.

5. Check DIN connector terminal block for electrical markings. Then make electrical hookup to terminal block according to markings on it. Snap terminal block into connector cover and install center screw.
6. Position connector gasket on solenoid and install plug connector. Torque center screw to 5 ± 1 in-lbs [0,6 ± 1,1 Nm].

NOTE: Alternating current (AC) and direct current (DC) solenoids are built differently. To convert from one to the other, it may be necessary to change the complete solenoid including the core and solenoid base sub-assembly, not just the solenoid. Consult ASCO.

Installation of Solenoid

Solenoids may be assembled as a complete unit. Tightening is accomplished by means of a hex flange at the base of the solenoid. The 3/4" bonnet construction (Figure 1) must be disassembled for installation and installed with a special wrench adapter.

Installation of Panel Mounted Solenoid (See Figure 3)

Disassemble solenoid following instruction under *Solenoid Replacement* then proceed

3/4" Valve Bonnet Construction

1. Install retainer (convex side to solenoid) in 1.312 diameter mounting hole in customer panel.
2. Then position spring washer over plugnut/core tube sub-assembly.
3. Install plugnut/core tube sub-assembly through retainer in customer panel. Then replace solenoid, nameplate/retainer and red cap.

15/16" Valve Bonnet Construction

1. Install solenoid base sub-assembly through 0.69 diameter mounting hole in customer panel.
2. Position spring washer on opposite side of panel over solenoid base sub-assembly then replace.

Solenoid Temperature

Standard solenoids are designed for continuous duty service. When the solenoid is energized for a long period, the solenoid becomes hot and can be touched by hand only for an instant. This is a safe operating temperature.

MAINTENANCE

WARNING: To prevent the possibility of death, serious injury or property damage, turn off electrical power, depressurize solenoid operator and/or valve, and vent fluid to a safe area before servicing.

Cleaning

All solenoid operators and valves should be cleaned periodically. The time between cleaning will vary depending on medium and service conditions. In general, if the voltage to the solenoid is correct, sluggish valve operation, excessive noise or leakage will indicate that cleaning is required. Clean strainer or filter when cleaning the valve.

Preventive Maintenance

- Keep the medium flowing through the solenoid operator or valve as free from dirt and foreign material as possible.
- While in service, the solenoid operator or valve should be operated at least once a month to insure proper opening and closing.
- Depending on the medium and service conditions, periodic inspection of internal valve parts for damage or excessive wear is recommended. Thoroughly clean all parts. Replace any worn or damaged parts.

Causes of Improper Operation

- **Faulty Control Circuit:** Check the electrical system by energizing the solenoid. A metallic *click* signifies that the solenoid is operating. Absence of the *click* indicates loss of power supply. Check for loose or blown fuses, open-circuited or grounded solenoid, broken lead wires or splice connections.
- **Burned-Out Solenoid:** Check for open-circuited solenoid. Replace if necessary. Check supply voltage; it must be the same as specified on nameplate/retainer and marked on the solenoid. Check ambient temperature and check that the core is not jammed.
- **Low Voltage:** Check voltage across the solenoid leads. Voltage must be at least 85% of rated voltage.

Solenoid Replacement

1. On solenoids with lead wires disconnect conduit, coil leads, and grounding wire.

NOTE: Any optional parts attached to the old solenoid must be reinstalled on the new solenoid.

2. Disassemble solenoids with optional features as follows:

• Spade or Screw Terminals

Remove terminal connections, grounding screw, grounding wire, and terminal block (screw terminal type only).

NOTE: For screw terminals, the socket head screw holding the terminal block serves as a grounding screw.

• Junction Box

Remove conduit and socket head screw (use 5/32" hex key wrench) from center of junction box. Disconnect junction box from solenoid.

• DIN Plug Connector

Remove center screw from DIN plug connector. Disconnect DIN plug connector from adapter. Remove socket head screw (use 5/32" hex key wrench), DIN terminal adapter, and gasket from solenoid.

3. Snap off red cap from top of solenoid base sub-assembly.
4. Push down on solenoid. Then using a suitable screwdriver, insert blade in slot provided between solenoid and nameplate/retainer. Pry up slightly and push to remove. Then remove solenoid from solenoid base sub-assembly.
5. Reassemble using exploded views for parts identification and placement

Disassembly and Reassembly of Solenoids

1. Remove solenoid, see *Solenoid Replacement*.
2. Remove finger washer or spring washer from solenoid base sub-assembly.
3. Unscrew solenoid base sub-assembly.

NOTE: Some solenoid constructions have a plugnut/core tube sub-assembly, bonnet gasket and bonnet in place of the solenoid base sub-assembly. To remove bonnet use special wrench adapter supplied in ASCO Rebuild Kit. For wrench adapter only, order ASCO Wrench Kit No.K218948.

4. The core is now accessible for cleaning or replacement.
5. If the solenoid is part of a valve, refer to basic valve installation and maintenance instructions for further disassembly.
6. Reassemble using exploded views for identification and placement of parts.

ORDERING INFORMATION FOR ASCO SOLENOIDS

When Ordering Solenoids for ASCO Solenoid Operators or Valves, order the number stamped on the solenoid. Also specify voltage and frequency.



Torque Chart

Part Name	Torque Value in Inch-Pounds	Torque Value in Newton-Meters
solenoid base sub-assembly	175 ± 25	19,8 ± 2,8
valve bonnet (3/4" bonnet construction)	90 ± 10	10,2 ± 1,1
bonnet screw (3/8" or 1/2" NPT pipe size)	25	2,8
bonnet screw (3/4" NPT pipe size)	40	4,5

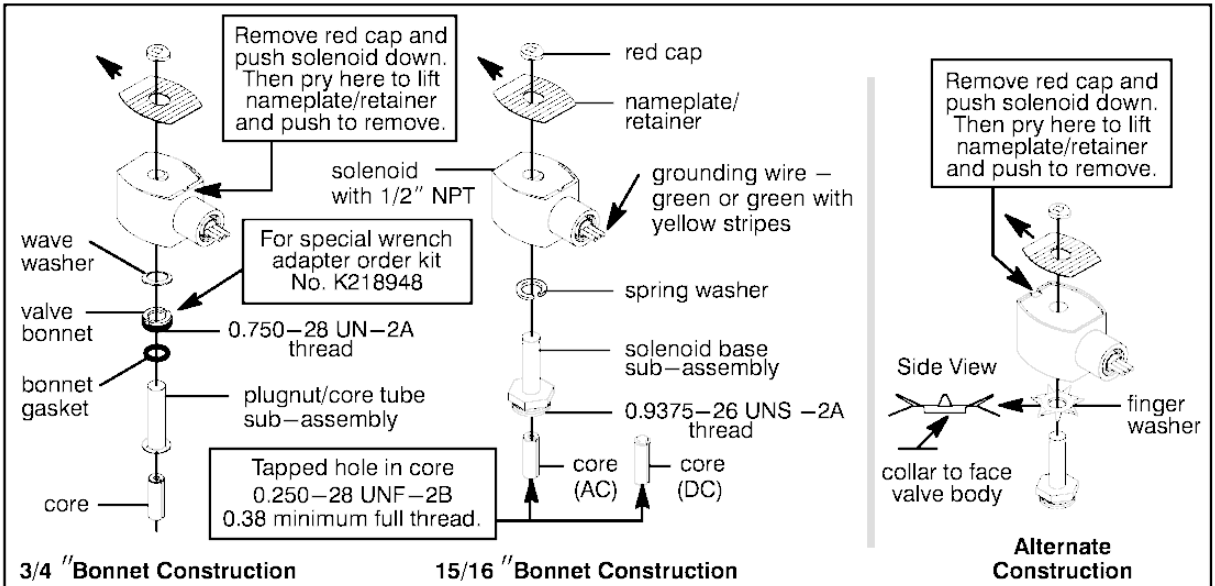


Figure 1. Series 8016G solenoids

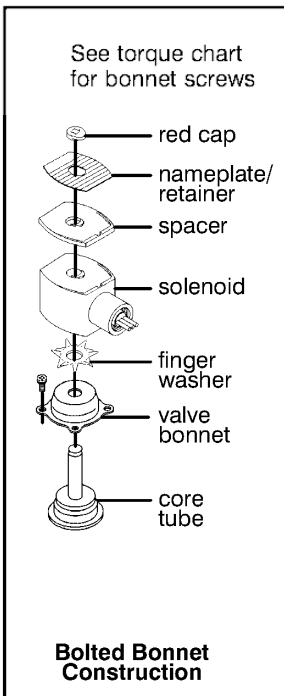


Figure 2. Series 8016G solenoid

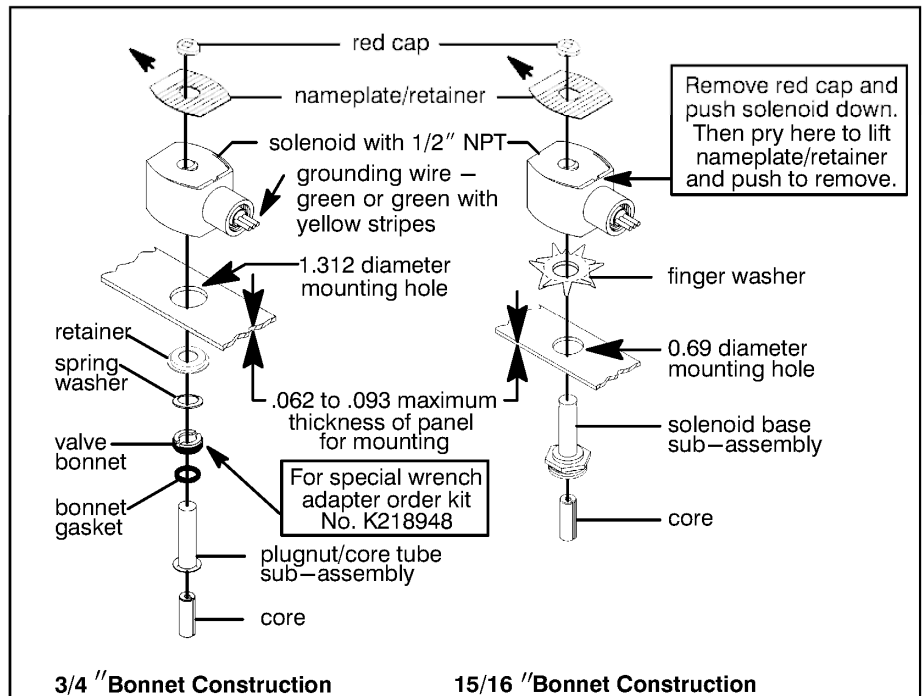


Figure 3. Series 8016G panel mounted solenoids

Torque Chart

Part Name	Torque Value in Inch-Pounds	Torque Value in Newton-Meters
terminal block screws	10 ± 2	1,1 ± 0,2
socket head screw	15 – 20	1,7 – 2,3
center screw	5 ± 1	0,6 ± 0,1

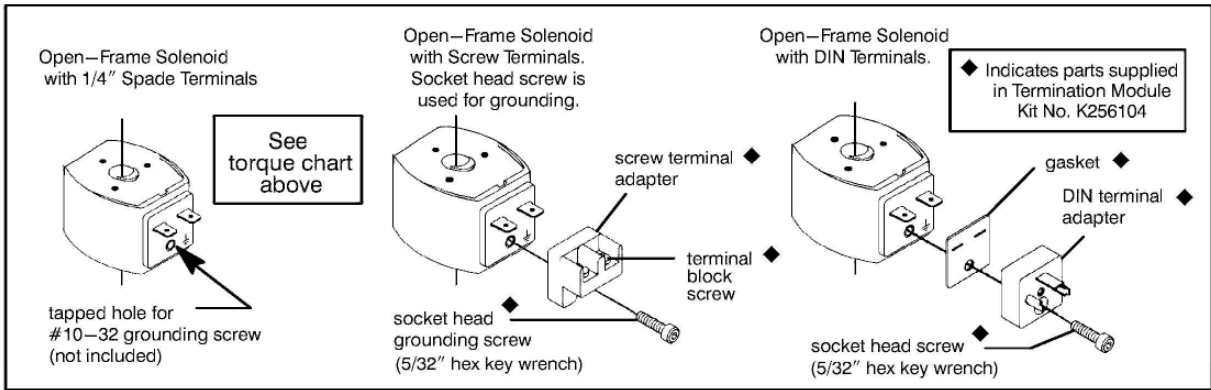


Figure 4. Open-frame solenoids

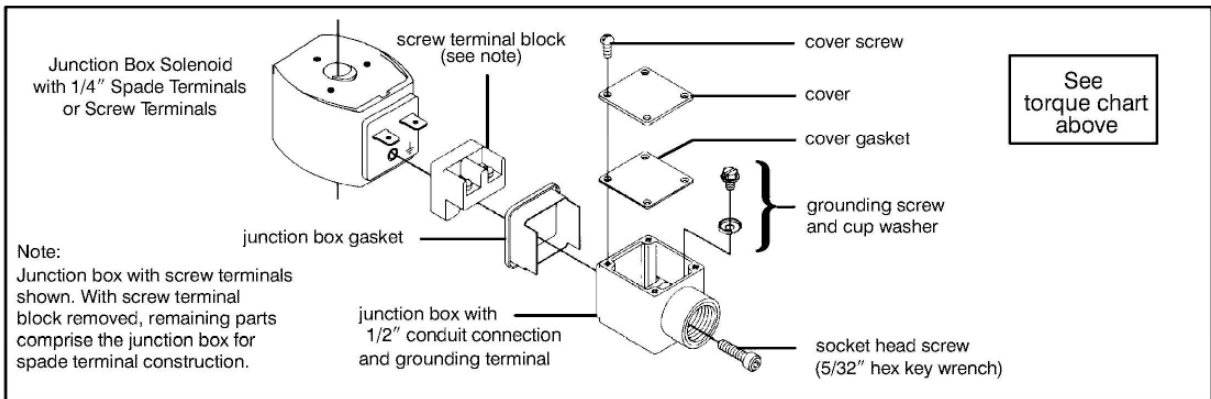


Figure 5. Junction box (optional feature)

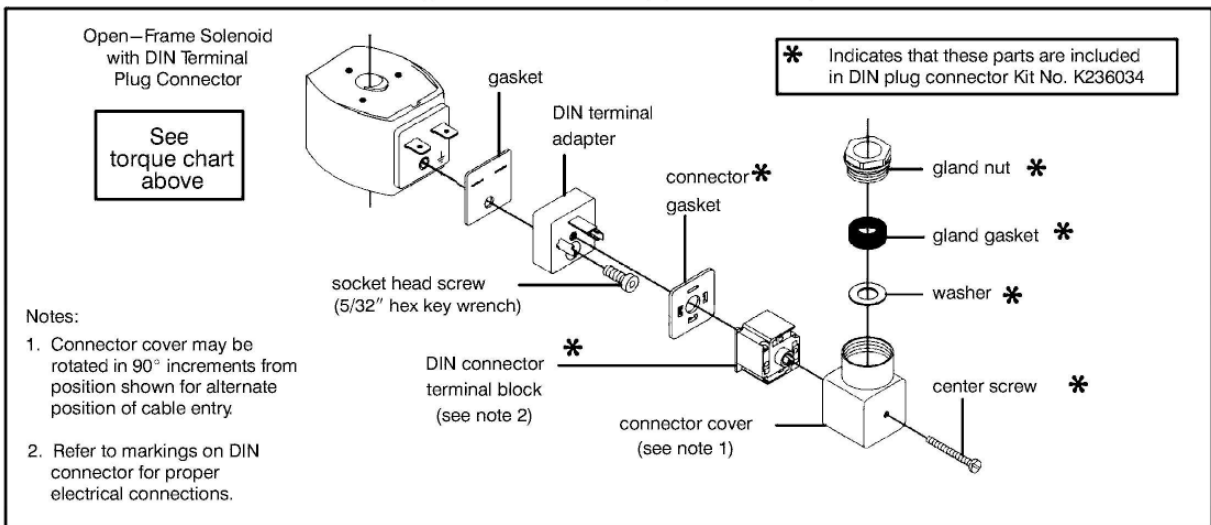


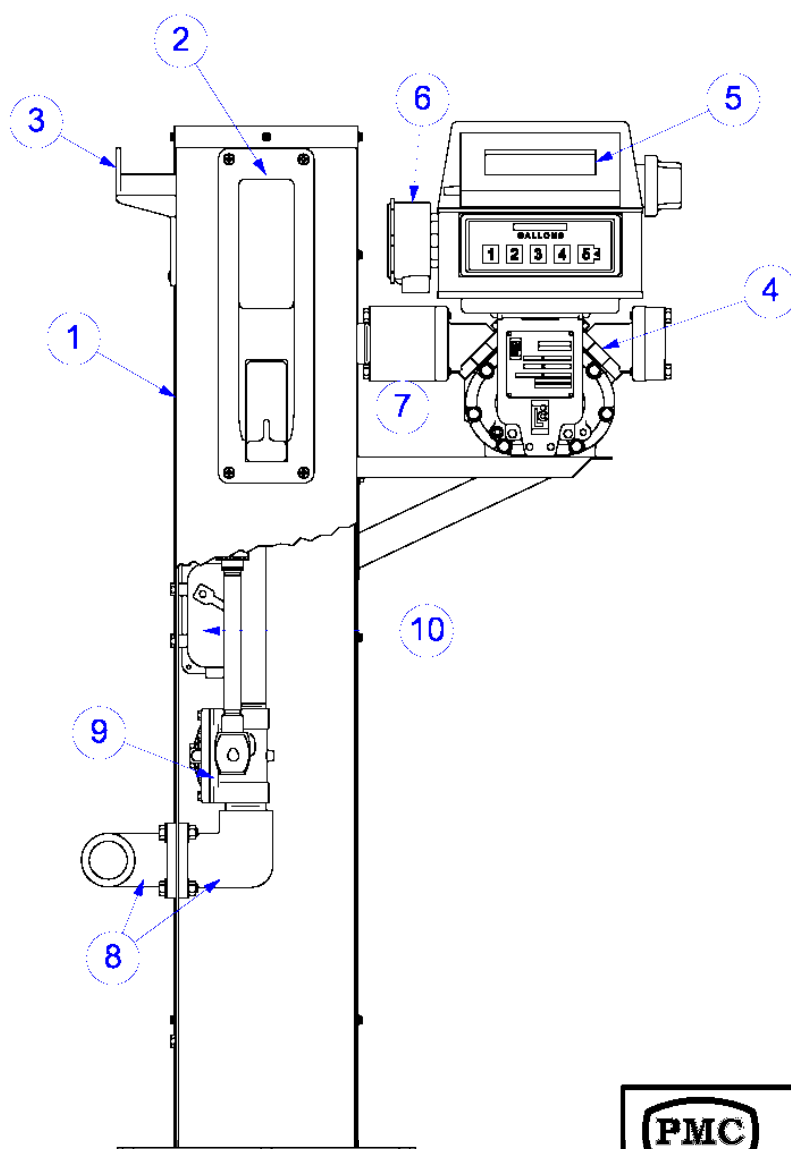
Figure 6. DIN plug connector kit No. K236034 (optional feature)


9 - DIAGRAMS

The following diagrams / drawings are provided to assist with installing the **MSH** dispenser. Ensure that the proper diagram(s) is/are used for the installation. Failure to properly wire the dispenser may result in damage to both the dispenser and other equipment connected to it. Be sure to pay attention to any and all notes associated with the diagrams.

Drawing No.	Drawing Description	Page
91-08G123	PARTS - MSH-32 / 34 Assembly	9-3
91-05A65	PARTS - MSH-62 / 64 Assembly	9-4
91-12G11186	PARTS - Explosion-Proof Switch Box Assembly	9-5
91-02A22	PARTS - NB2 Nozzle Boot Assembly	9-6
91-04A62	MSH Group Typical Install	9-7
91-14G05131	WIRING - MSH Master (Standalone)	9-9
91-14G05132	WIRING - MSH Master w/ Satellite (Standalone)	9-10
91-12G09281	WIRING - Fuelmaster to MSH Master & Satellite (1)	9-11
91-12G09281	WIRING - Fuelmaster to MSH Master & Satellite (2)	9-12
91-12G09281	WIRING - Fuelmaster to MSH Master	9-13

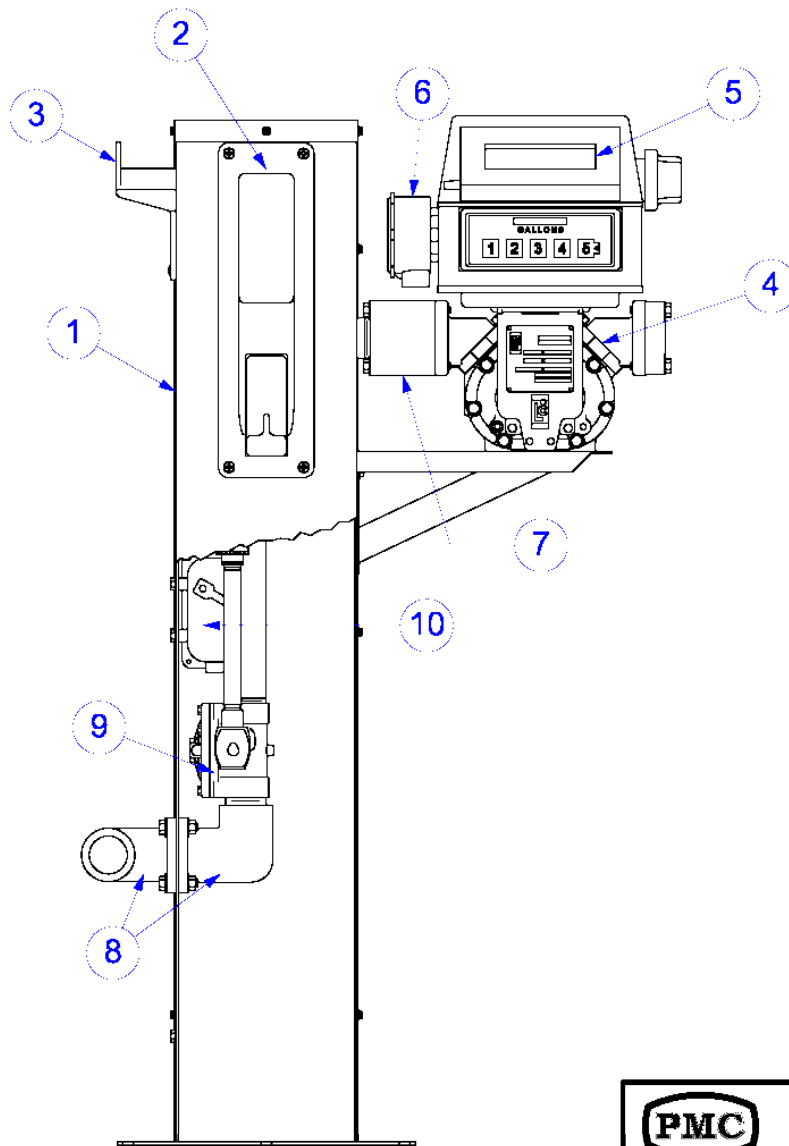
NO	PART NO	DESCRIPTION	NOTES
1	CONTACT PMC	MSH-30 STAND ASSEMBLY	
2	NB-2	ON / OFF LEVER ASSEMBLY	
3	75-MS1	HOSE HANGER	
4	M5A1	LC METER / COUNTER ASSEMBLY	
5	0789030-002	ZERO START TICKET PRINTER	OPTIONAL EQUIPMENT
6	CONTACT PMC	VEEDER-ROOT PULSER	OPTIONAL EQUIPMENT
7	85-SF17A	SATELLITE FUEL BLOCK	(MSH-34BA Only)
8	FL1-90	1" FNPT FLANGED ELBOW	
9	EF8210G004V	NORMALLY CLOSED SOLENOID	
10	SW1-2	SWITCH ASSEMBLY	SEE PMC DRAWING NO 91-98A29




 Pump Measure Control, Inc. 1070 Nine North Drive, Suite 100 Alpharetta, GA 30004 PH. 770-667-0667 FAX 770-667-0476 DRAWING NUMBER: 91-08G123	MSH-32 / 34 PARTS ASSEMBLY	
	DATE: 3/16/05	DRAWN BY: CAT
	SCALE: NTS	
THIS DRAWING CONTAINS PROPRIETARY INFORMATION AND IS SUBJECT TO COPYRIGHT OWNERSHIP BY PMC, INC.		

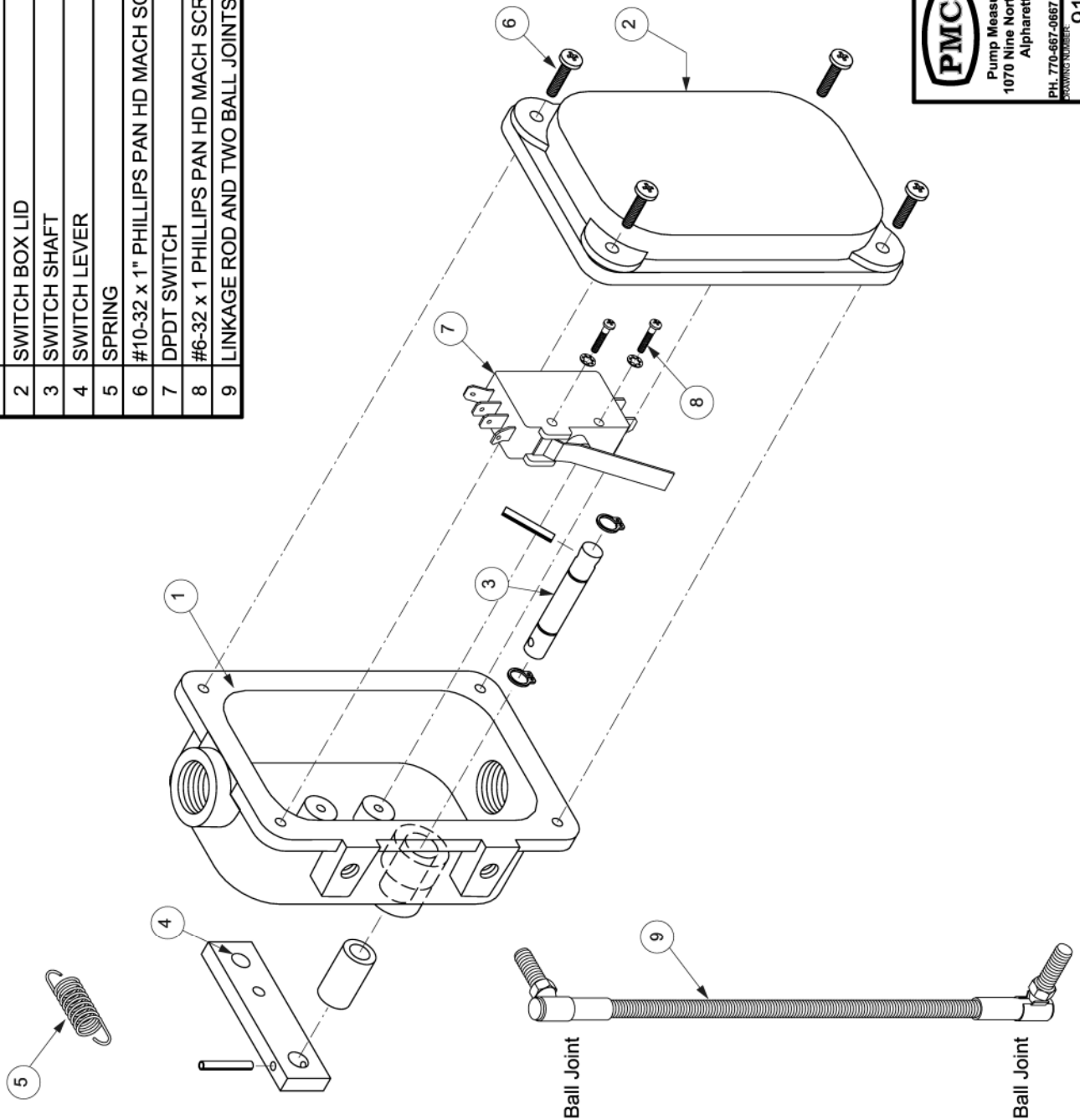
Diagrams


NO	PART NO	DESCRIPTION	NOTES
1	CONTACT PMC	MSH-60 STAND ASSEMBLY	
2	NB-2	ON / OFF LEVER ASSEMBLY	
3	75-MS1	HOSE HANGER	
4	M5A1	LC METER / COUNTER ASSEMBLY	
5	0789030-002	ZERO START TICKET PRINTER	OPTIONAL EQUIPMENT
6	CONTACT PMC	VEEDER-ROOT PULSER	OPTIONAL EQUIPMENT
7	85-SF17A	SATELLITE FUEL BLOCK	(MSH-64BA Only)
8	FL1.5-90	1-1/2" FNPT ELBOW	
9	EF8210G022V	NORMALLY CLOSED SOLENOID	
10	SW1-2	SWITCH ASSEMBLY	SEE PMC DRAWING NO 91-98A29



 Pump Measure Control, Inc. 1070 Nine North Drive, Suite 100 Alpharetta, GA 30004 PH. 770-667-0667 FAX 770-667-0476 DRAWING NUMBER: 91-05A65	MSH-62 / 64 PARTS ASSEMBLY	
	DATE: 2/15/02	DRAWN BY: CAT
	SCALE: NTS	
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NO.	DESCRIPTION	QTY	PART NO.
1	SWITCH BOX HOUSING	1	75-SW1
2	SWITCH BOX LID	1	75-SW2
3	SWITCH SHAFT	1	75-SW3
4	SWITCH LEVER	1	75-SW4
5	SPRING	1	75-SW5
6	#10-32 x 1" PHILLIPS PAN HD MACH SCREW	4	35-41105
7	DPDT SWITCH	1	65-E20
8	#6-32 x 1 PHILLIPS PAN HD MACH SCREW	2	35-22102
9	LINKAGE ROD AND TWO BALL JOINTS	1	LRBJ





PMC
Pump Measure Control, Inc.
1070 Nine North Drive, Suite 100
Alpharetta, GA 30004

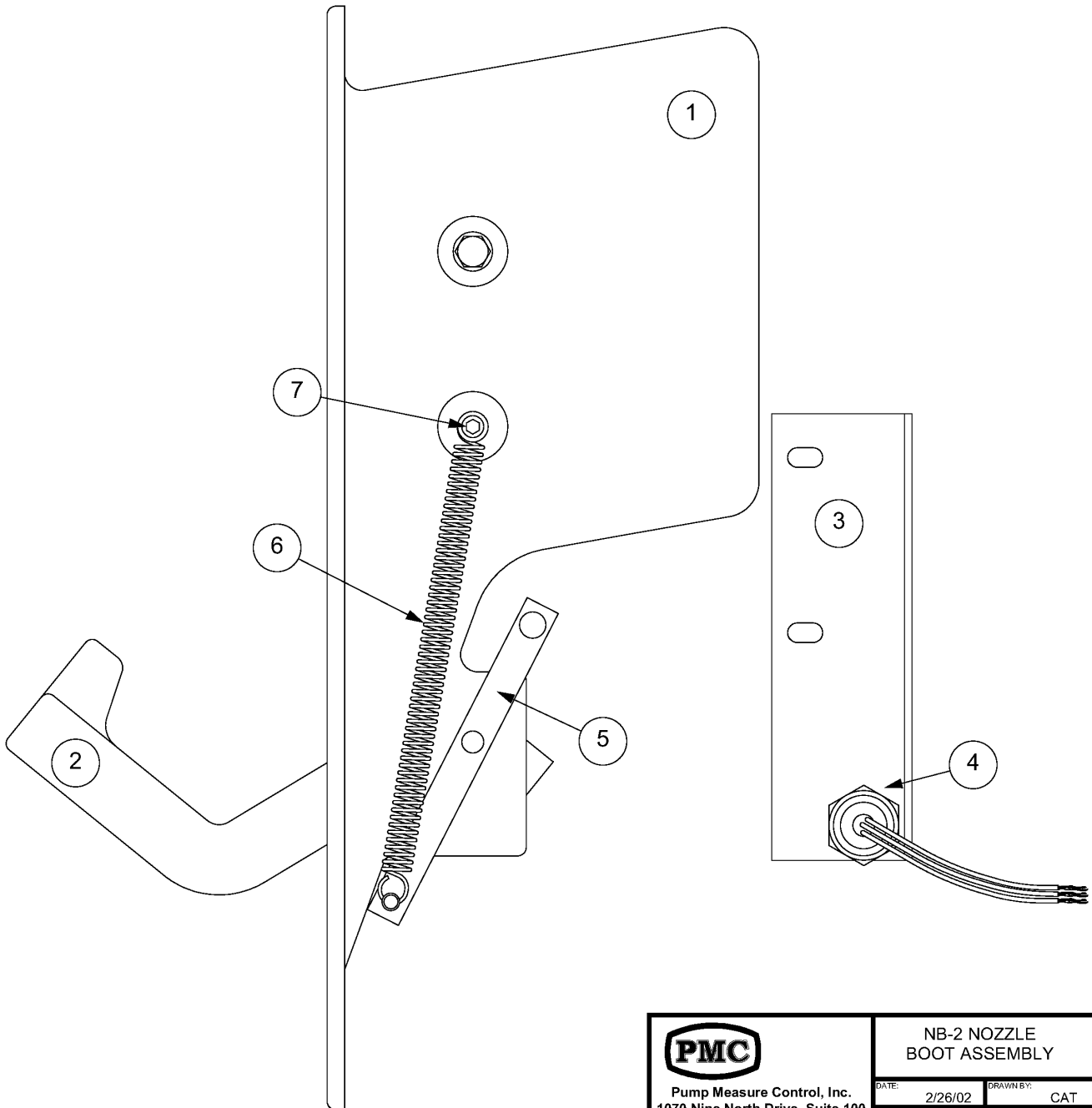
**EXPLOSION PROOF
SWITCH BOX ASSEMBLY**


DATE: 7/13/12 DRAWN BY: CAT
SCALE: NTS

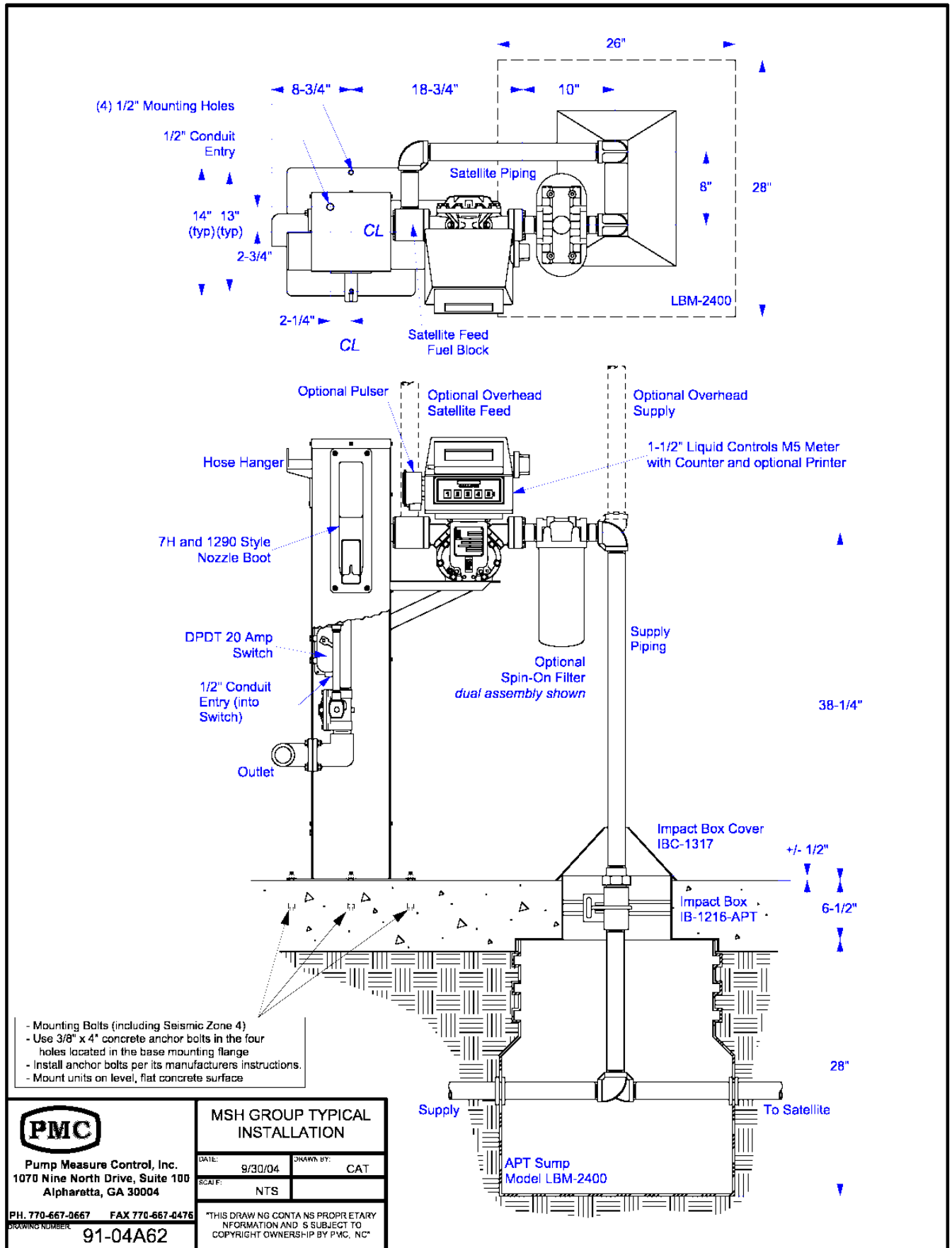
PH. 770-667-0667 FAX 770-667-0476
DRAWING NUMBER: **91-12G11186**

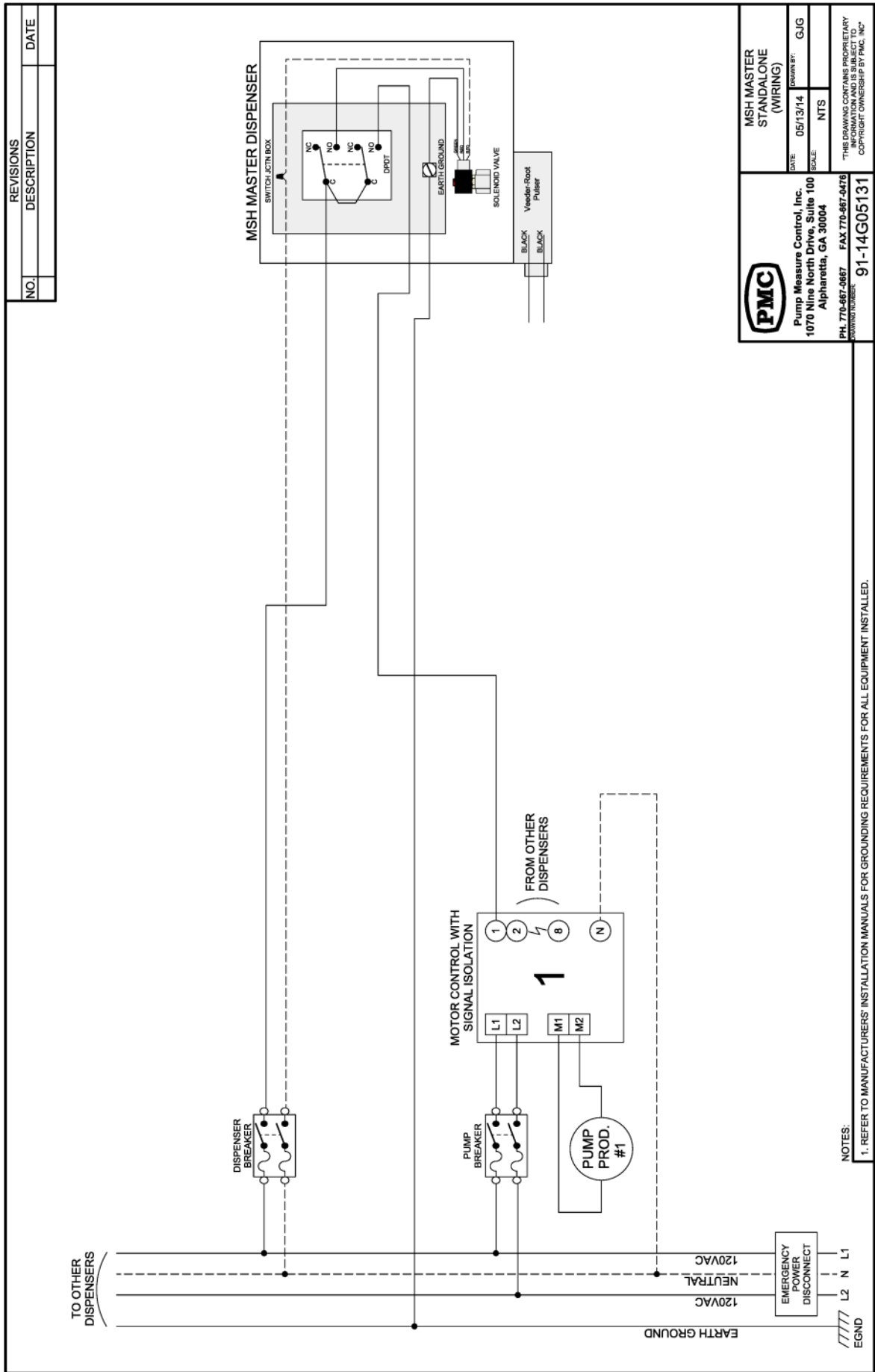
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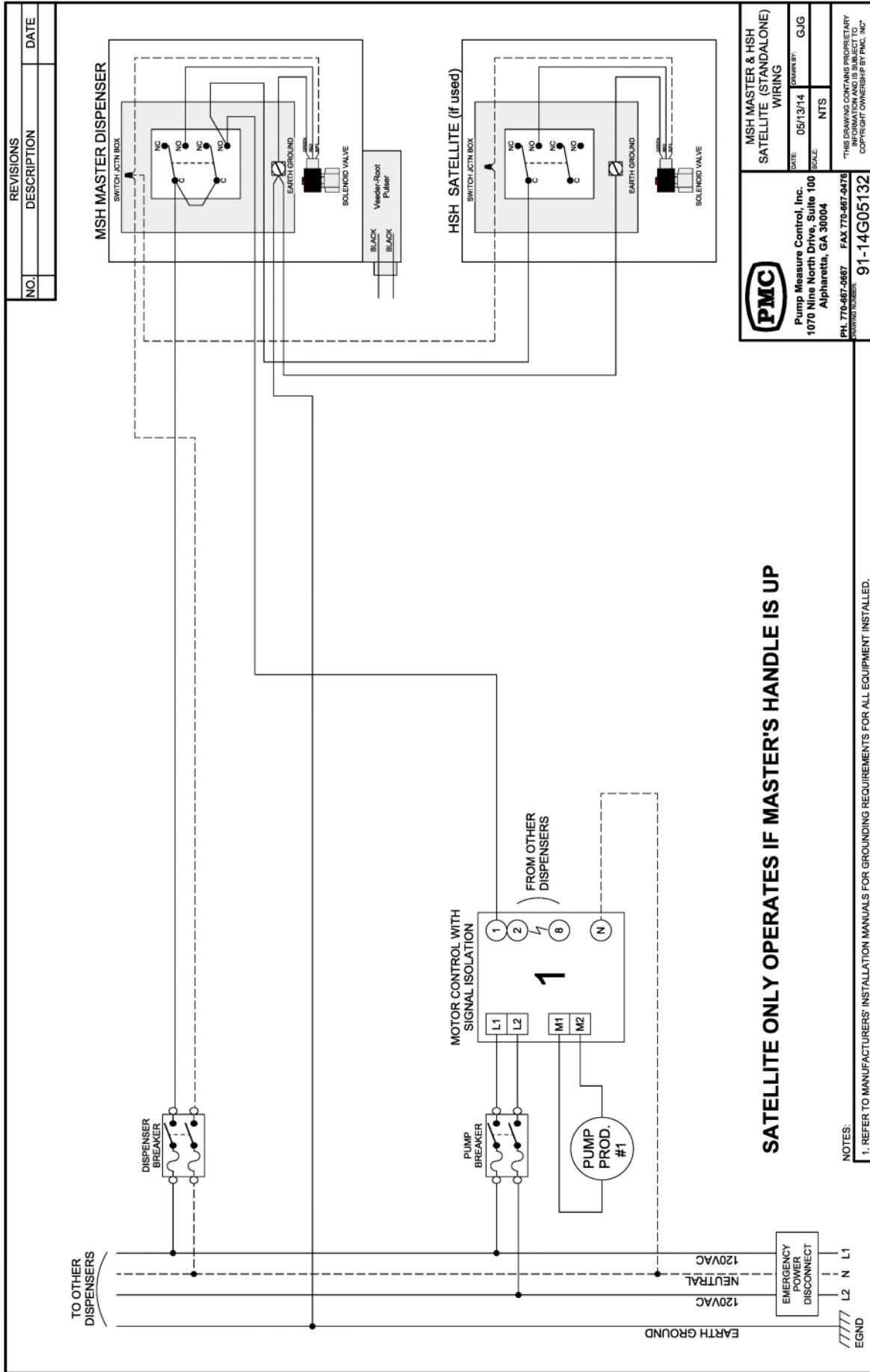
PART #	PART DESCRIPTION
1 75-NB-2A	NOZZLE BOOT HOUSING (incl LEVER)
2 75-NB-2B	LEVER (Not sold separately)
3 20-10006-SS	SENSOR MOUNTING PLATE (FH Only)
4 65-PRX-1	SENSOR (FH Only)
5 85-NB-7	LEVER SHAFT
6 NB-5	SPRING
7 '35-62035	5/16 X 3/8" SS SHOULDER SCREW

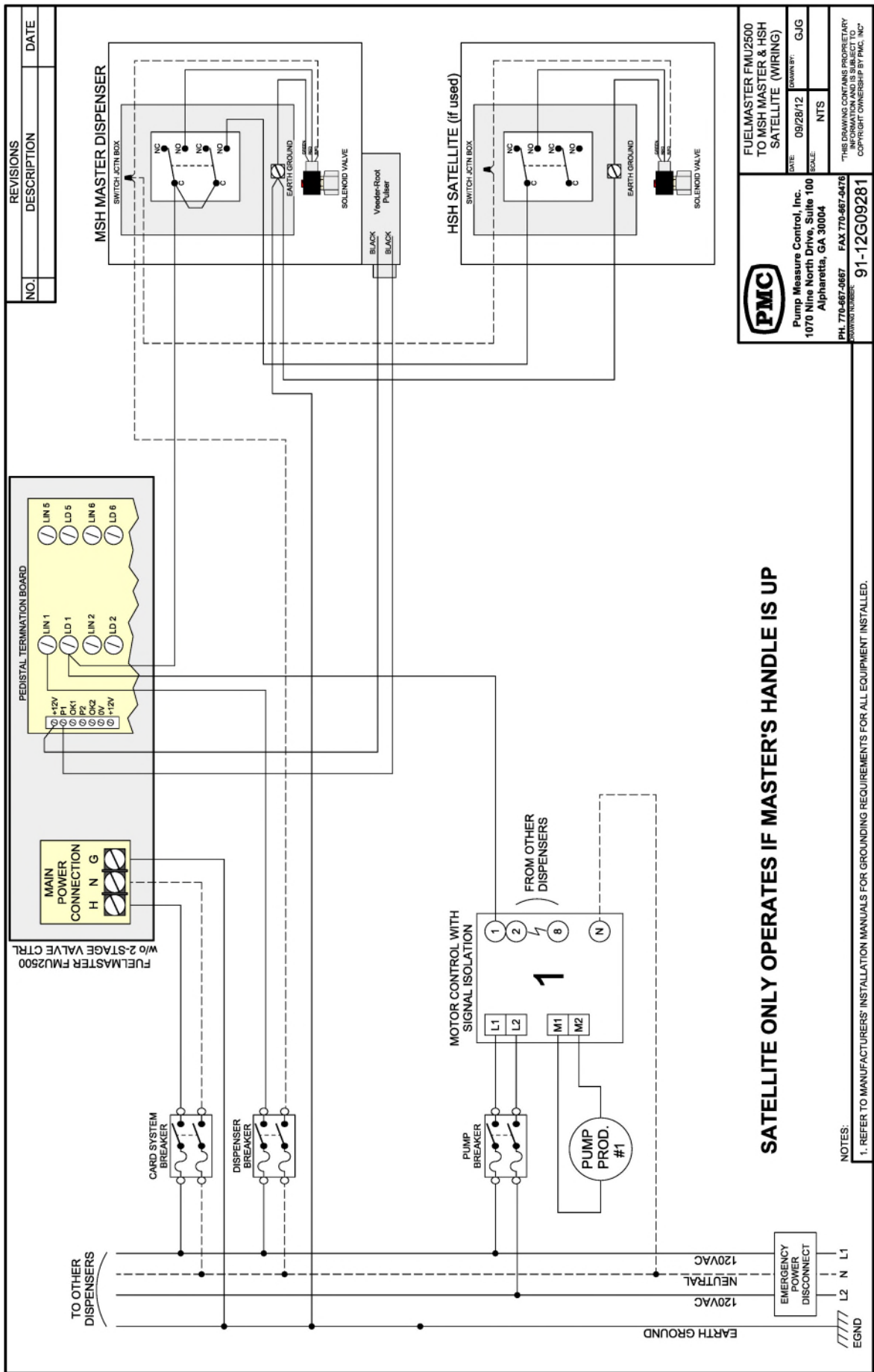


 Pump Measure Control, Inc. 1070 Nine North Drive, Suite 100 Alpharetta, GA 30004 PH. 770-667-0667 FAX 770-667-0476 <small>DRAWING NUMBER</small>	NB-2 NOZZLE BOOT ASSEMBLY	
	<small>DATE:</small> 2/26/02	<small>DRAWN BY:</small> CAT
	<small>SCALE:</small> NTS	
	<small>*THIS DRAWING CONTAINS PROPRIETARY INFORMATION AND IS SUBJECT TO COPYRIGHT OWNERSHIP BY PMC, INC.*</small>	
91-02A22		









SATELLITE ONLY OPERATES IF MASTER'S HANDLE IS UP

NO.	REVISIONS DESCRIPTION	DATE

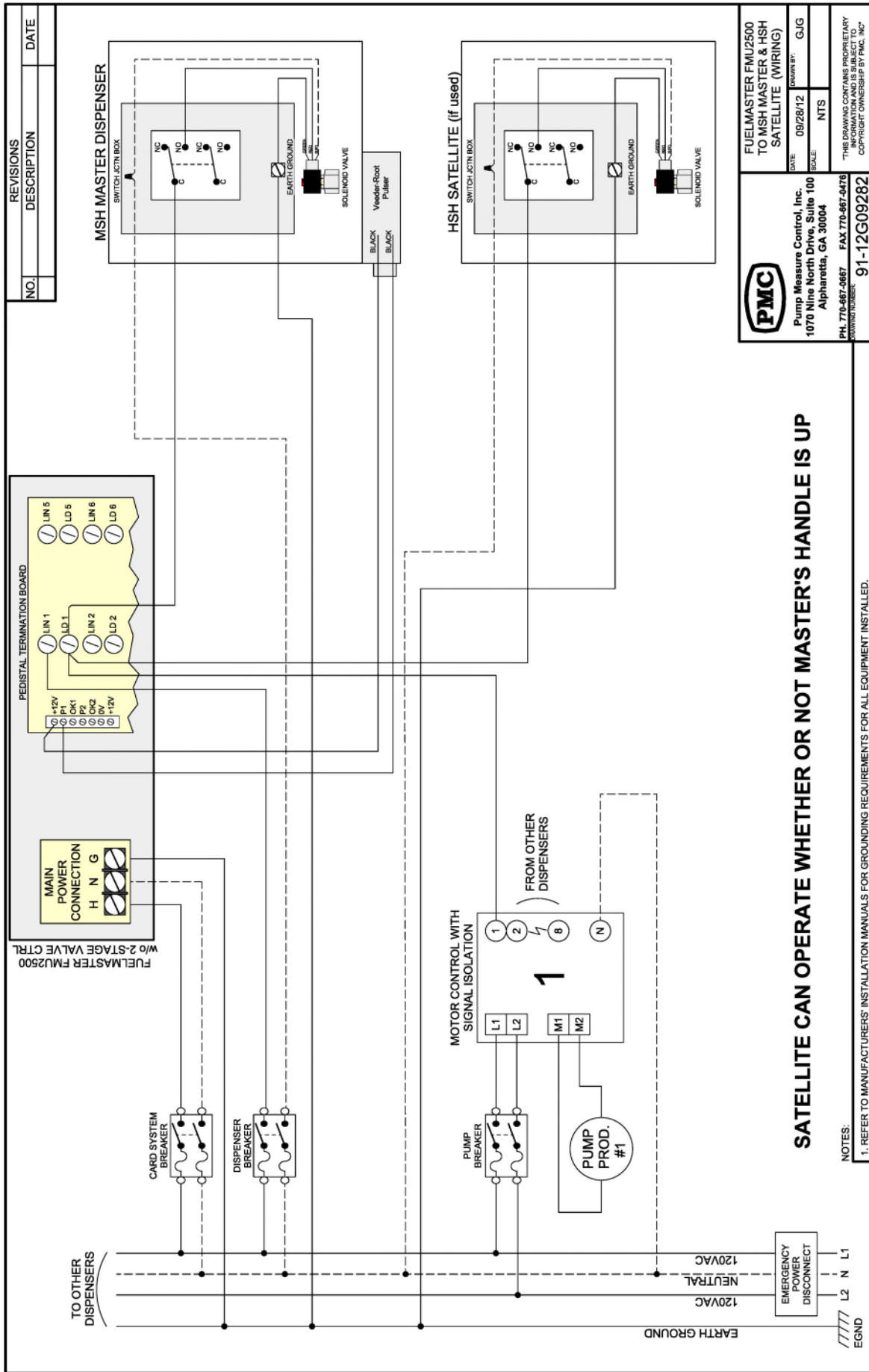
PMC
 Pump Measure Control, Inc.
 1070 Niles North Drive, Suite 100
 Alpharetta, GA 30004
 PH. 770-467-0667 FAX 770-667-4476
 DRAWING NUMBER: **91-12G09281**

FUEL MASTER FMU2500
 TO MSH MASTER & HSH
 SATELLITE (WIRING)

DATE: 09/28/12 DRAWN BY: G.J.G.
 TITLE: NTS

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 INFORMATION AND IS SUBJECT TO
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NOTES:
 1. REFER TO MANUFACTURERS' INSTALLATION MANUALS FOR GROUNDING REQUIREMENTS FOR ALL EQUIPMENT INSTALLED.



REVISIONS		DATE
NO.	DESCRIPTION	

PMC
 Pump Measure Control, Inc.
 1070 Nine North Drive, Suite 100
 Alpharetta, GA 30004
 PH. 770.467.4687 FAX 770.667.4476
 DRAWING NUMBER: 91-12G09282

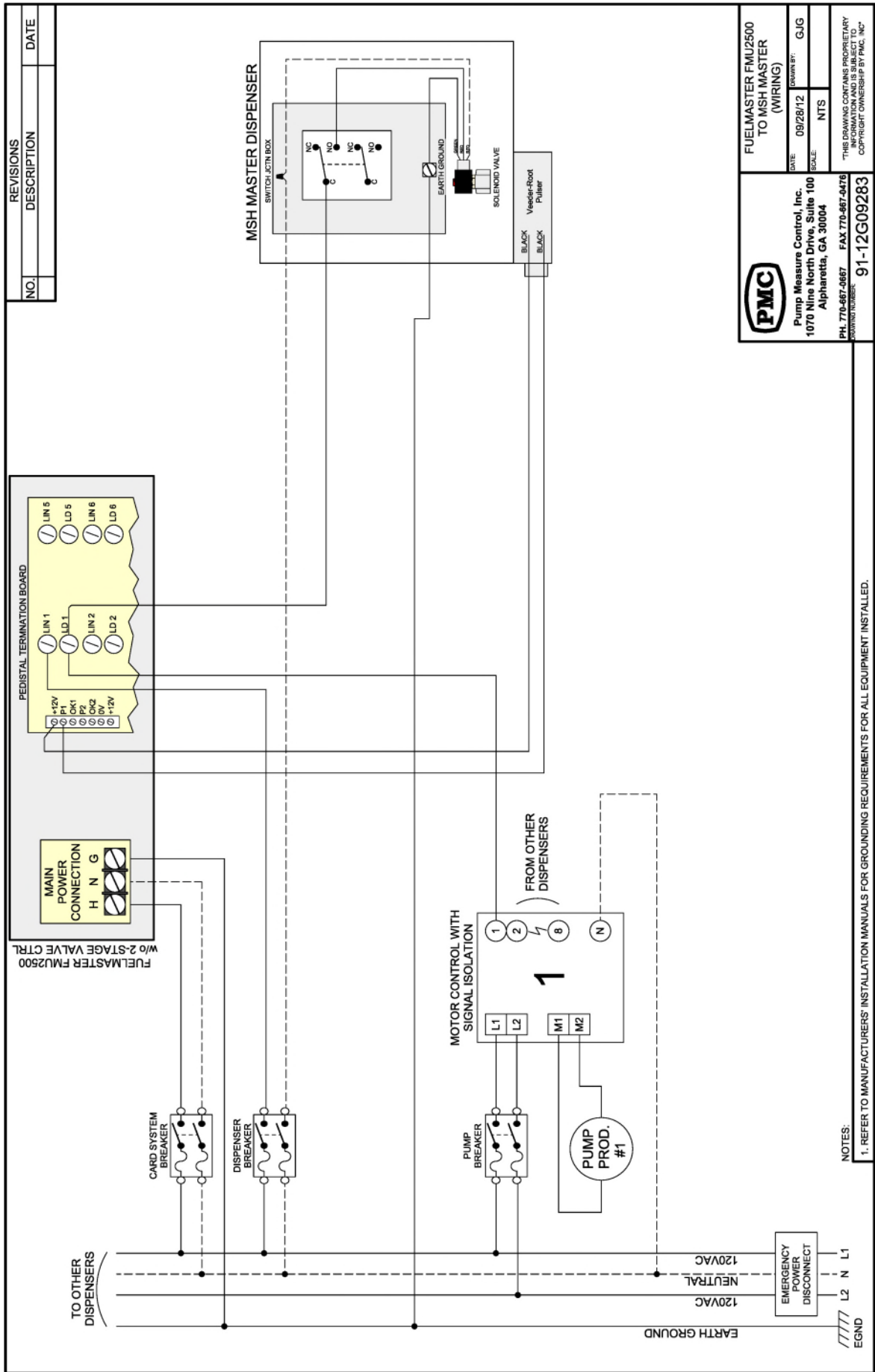
DATE	09/28/12	DRAWN BY	G/JG
SCALE	NTS		

FUELMASTER FMU2500 TO MSH MASTER & HSH SATELLITE (WIRING)

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SATELLITE CAN OPERATE WHETHER OR NOT MASTER'S HANDLE IS UP

- NOTES:
 1. REFER TO MANUFACTURERS' INSTALLATION MANUALS FOR GROUNDING REQUIREMENTS FOR ALL EQUIPMENT INSTALLED.



NO.	REVISIONS DESCRIPTION	DATE

PMC
 Pump Measure Control, Inc.
 1070 Nine North Drive, Suite 100
 Alpharetta, GA 30004
 PH. 770-467-0667 FAX 770-667-4476
 DRAWING NUMBER: **91-12G09283**

FUEL MASTER FMU2500
 TO MSH MASTER
 (WIRING)

DATE: 09/28/12 DRAWN BY: G/JG
 TITLE: NTS

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NOTES:
 1. REFER TO MANUFACTURERS' INSTALLATION MANUALS FOR GROUNDING REQUIREMENTS FOR ALL EQUIPMENT INSTALLED.

